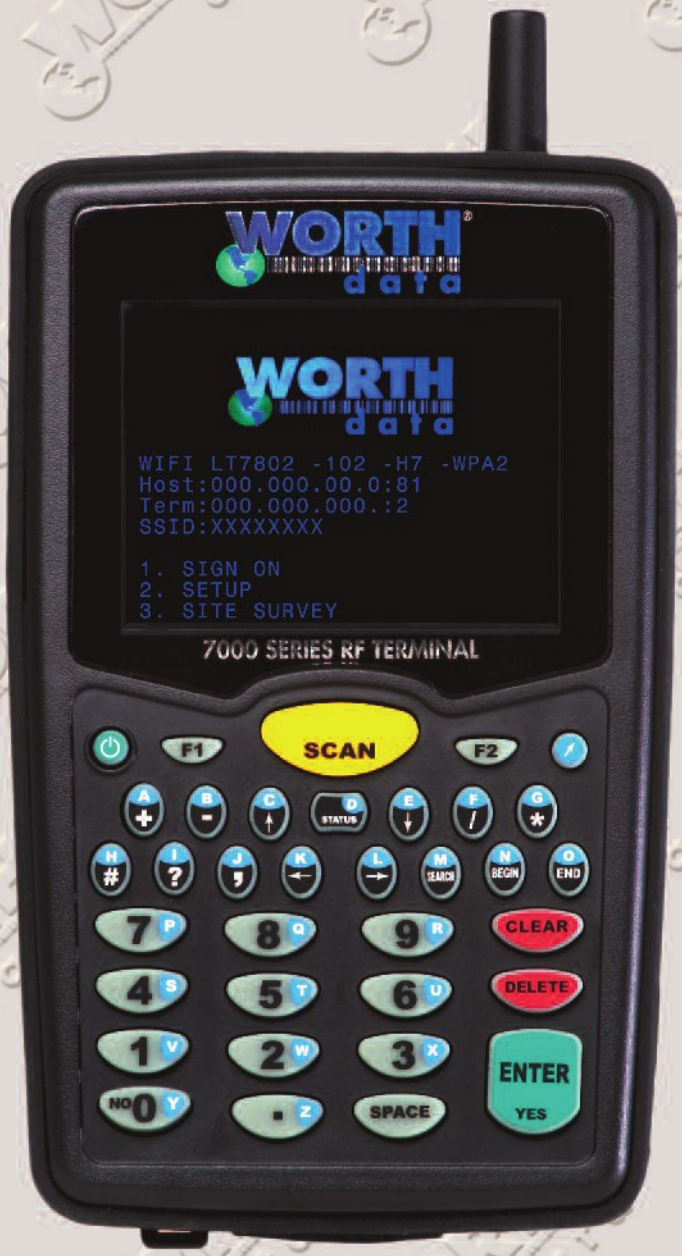
7802 WiFi Terminal

Worth Data®

7800 Series

Host Controlled

WiFi Terminal System



Owner's Manual

www.worthdata.com

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Shielded cables and I/O cords must be used with this equipment to comply with the relevant FCC regulations. Changes or modifications not expressly approved in writing by Worth Data may void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with RSS-210 of Industry Canada. Operation is subject to the following two conditions: 1) this device may not cause interference, and 2) this device must accept any interference, including interference that may cause undesired operation of the device.

The radio module contained within the 7802 Wi-Fi RF Terminal is Wi-Fi Alliance certified.

The 7802 Wi-Fi RF Terminals have been approved for use in the United States, Canada and Europe as a low power spread-spectrum radio operating in the unlicensed 2.412-2.472 GHz frequency range.

LASER LIGHT IS EMITTED FROM THIS APERTURE
CAUTION AVOID EXPOSURE • LASER LIGHT DO NOT STARE INTO BEAM
680 nm LASER • 1.0 MILLIWATT MAX OUTPUT
CLASS II LASER PRODUCT

The LT7802x has a laser scanner integrated with the Terminal as one unit. The laser used is a Class II Laser Product and has a 1.2 Milliwatt Output. To operate the laser scanner, aim the top of the case at a bar code, and press the yellow scan key on the keyboard of the Wi-Fi RF Terminal. The light source will turn off, once a successful scan has occurred or 2.5 seconds has elapsed, whichever is first. Do not look directly into the laser light source with the "Scan Key" depressed; avoid direct eye contact with the laser light source.

The LTnnnn models of the Wi-Fi RF Terminal are covered by one or more of the following U.S. Patents:

Patent #	4,360,798	4,369,361	4,387,297	4,460,120
4,496,831	4,593,186	4,603,262	4,607,156	4,652,750
4673,805	4,736,095	4,758,717	4,816,660	4,845,350
4,896,026	4,897,532	4,923,281	4,933,538	4,992,717
5,015,833	5017765	5,021,641	5,029,183	5,047,617
5,103,461	5,113,445	5,140,144	5,142,550	5,149,950
5,157,687	5,168,148	5,168,149	5,180,904	5,229,591
5,230,088	5,235,167	5,243,655	5,247,162	5,250,791
5,250,792	5,262,627	5,280,163	5,280,164	5,280,498
5,304,786	5,304,788	5,321,246	5,377,361	5,367,151
5,373,148	5,378,882	5,396,053	5,396,055	5,399,646
5,408,081	5,410,139	5,410,140	5,412,198	5,418,812
4,420,411	5,436,440	5,444,231	5,449,891	5,449,893
5,468,949	5,479,000	5,479,002	5,479,441	5,504,322
5,528,621	5,532,469	5,543,610	5,545,889	5,552,592
5,578,810	5,589,680	5,612,531		

There are no user adjustments or maintenance operations to be performed on the integrated laser scanner.

The Wi-Fi CERTIFIED Logo is a certification mark of the Wi-Fi Alliance.

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Introduction

The 7802 Wi-Fi RF Terminal is a low cost, easy-to-use radio frequency interactive terminal which communicates using the IEEE 802.11b/g protocol. It is designed to connect to a Wi-Fi network using an access point or wireless router. This terminal offers unprecedented power and ease of use, while maintaining compatibility with programs written for the older Worth Data Terminals. The list of features include:

- Low Cost
- Spread Spectrum frequency hopping avoids interference
- No license required in USA, Canada or Europe
- Small size, (5.9" L, 3.6" W, 1.0" D) even with laser
- Certified to multiple 5 ft. drops to concrete
- Long Battery Life (15 hours of usage)
- Fast Recharging (2-3 hours) from External Power Supply
- No programming necessary on terminal
- User Customizable Voice Prompting plus Display
- Backlit Color 2.8” TFT Display Standard
- Uses Li-Ion battery

Differences

The 7802 uses the same screen formatting and prompt commands as the long range T7000. The major difference between the 7802 and the T7000 is the radio and range. The 7802 uses a Wi-Fi radio that communicates with Wi-Fi access points (APs) connected to a local area network (LAN). The T7000 connects to a R5000 Base Station connected to a single PC. The 7802 communicates with a host program running on a server that is accessible over the internet. The T7000 communicates with a host program that is running on the computer that is connected to the B5000 Base.

Here's a summary of the differences:

- The 7802 has a range of a few hundred feet and the T7000 has a range of a few miles.
- The 7802 works with most 802.11b/g access points or wireless routers, no B5000 required.
- The host program for the 7802 can run on a server remote from the access point.
- No fixed limit to the number of 7802 Terminals on a network. Each 7802 Terminal has a unique IP address on the network.

Chapter 1: Installation

Components

The components in your Wi-Fi RF Terminal system will vary according to the configuration of your system. Your Wi-Fi RF Terminal shipment should contain at least:

- **A Wi-Fi RF Terminal** T**7802 or LT7802 -** If the Wi-Fi RF Terminal is an LT7802 model, it will have an integrated laser scanner built-in to the body of the terminal.
- **USB Cable** – for programming and voice prompt upload.
- **5V Power Supply –** battery charger with adapter cable.
- **Utilities CD ROM** – demo programs, DLL, and firmware loader program

Installation Sequence

1. Before you begin setting up the Wi-Fi RF Terminal you will need to know some information about the Wi-Fi network that it will be using. You will need the SSID and security type of the Wi-Fi network.
2. Now you can configure the Wi-Fi settings on the Wi-Fi RF Terminal. See Chapter 2 for more information on the configuration of the Wi-Fi RF Terminal.
3.
4. Now run one of the demo programs to validate that everything is working. If you have problems, refer to the **Trouble Shooting Section**.

RF Terminal Operation

Using the RF Terminal keypad…

The RF Terminal is turned on by pressing the green ON/OFF button located in the upper left-hand corner of the RF Terminal keypad.

It is a good idea to fully charge the RF Terminal before you use it the first time to make sure the battery is charged. See below for more information on battery charging.

The RF Terminal has a *Shut Down Time* feature that allows you to determine the length of time the RF Terminal must be inactive before automatically shutting down to conserve battery power. When the RF Terminal shuts down, simply press the ON/OFF button to resume operation.

The keypad is custom designed for RF Terminal operations. It has numeric and control keys in the non-shifted state, and alpha characters in its shifted state. Upper-case is the default mode after you press the SHIFT key. If you need to enter a lower-case alpha character then press the F2 key and the cursor will toggle between Red and Yellow. When the cursor is Red you will enter upper-case characters and when the cursor is Yellow you will enter lower-case characters.

For all prompts which ask for a YES or NO response, the ENTER key, is the YES reply, and the 0 (zero) key is the NO reply. As you key data, you will see each character displayed on the screen. If you make a

mistake, you can delete the last character by pressing the DELETE key, or you can clear all characters displayed on the screen by pressing the CLEAR key.

Battery Life Indicator

The Wi-Fi RF Terminal detects low battery and displays the following message:

LOW BATTERY
Charge Battery
Hit Any Key_

At this point you have approximately 10% of battery life remaining. You should complete what you are doing and charge the battery soon. When the battery is too low to operate the unit properly another message is displayed:

Battery too Low to Operate
Hit Any Key to Power Down

If you turn it back on without charging batteries, you may experience constant beeping, intermittent scanning, and very irritating symptoms that look like equipment failure.

The Wi-Fi RF Terminal also has a battery life indicator that can be accessed while operating. To display the remaining battery life of the battery (as well as the date and time) press the **STATUS** key:

mm/dd/yy hh:mm:ss
BATTERY: |||||||||||||||||| zz%

zz=percent in numbers i.e. 99, 10, 05
Press the **STATUS** key again to resume processing.

The lifetime of the Wi-Fi RF Terminal's Li-Ion battery is 500-1000 charge cycles. If the battery runtime seems to be significantly shorter than when the device was new, the battery should be replaced. If you have the optional "gun" handle with the extended battery then both batteries should be replaced at the same time. The main battery is a common digital camera battery sold as Fujifilm NP-120 or Pentax D-LI7. We use a high quality Japanese Li-Ion cell in our OEM pack that we supply with the Wi-Fi RF Terminal. You can obtain a replacement from Worth Data (P/N: L02) . Our pack is rated at 1950 mAh and provides the longest runtime available. Do not use a battery pack of unknown quality or origin. Doing so can risk damage to your unit. The optional handle battery is custom made for Worth Data and must be ordered from us.

Your old battery should be recycled. You can get free recycling information at: http://www.rbrc.org/

To change the internal battery:

1. Turn **OFF** the Wi-Fi RF Terminal.
2. Remove the battery holder door on the back of the Wi-Fi RF Terminal by removing the two screws holding the door in place..
3. Remove the old battery and insert a new one, making sure to orient the battery with the battery contacts facing the battery connector.
4. To replace the optional handle battery, remove the 2 screws holding the handle in place. Unplug the

handle battery assembly.

5. Replace the battery door and screws and turn the reader on using the ON/OFF switch.
6. It is a good idea to fully charge the new battery(s) before first use.

Recharging the battery:

1. With the RF Terminal shut off, plug the 5V power adapter into the RF Terminal using the supplied adapter cable.
2. The RF Terminal will turn On and display the following message:

   Charging Battery
   Please Wait…….

3. When the battery is fully charged after 2-4 hours the following messaged is displayed:

   Battery Charge
   Complete

4. The unit will remain ON for a half hour or so after the charge cycle has completed and then turn OFF.
5. If you press the POWER key while the unit is charging, nothing will happen.
6. If you press the POWER key after the unit has turned OFF after completing a charge cycle and the charger is still attached, the "Charging Battery" message will display again and a charge cycle will begin.
7. It will take about 2 hours to fully charge a unit with a single battery and about 4 hours to fully charge a unit with the optional handle battery.
8. Do not charge the battery if the Terminal is very hot or very cold since this will give a false reading on the condition of the battery and it may not get charged properly.
9. You cannot operate the unit when the charger is attached, except to charge the battery.

Wi-Fi RF Terminal Menu Functions

Upon power-up, the Wi-Fi RF Terminal displays the following opening screen:

Wi-Fi LT7802 - xxxx-Hyy-zzzz
Host:000.000.000.000:0000
Term:000.000.000.000:0000
SSID:

1. SIGN ON
2. SETUP
3. SITE SURVEY

*(The opening screen can be bypassed upon power up. See **Chapter 2**)*

- On first line on the screen, xxxx, gives the firmware revision number.
- Hyy indicates the version of the hardware.
- The Wi-Fi security type is shown at zzzz.
- Host: is the host server IP address.
- Term: is this Terminal's IP address (all 000's for DHCP).

- SSID is the name of the network that this terminal will connect to.
- Press the 1 key to SIGN ON to a host computer program through an access point.
- Pressing 2 enters the Setup Mode for the Wi-Fi RF Terminal.
- Press 3 to scan for access points that are within range of the Wi-Fi RF Terminal.

You can back-out of any mode or prompt by pressing the F1 key. For example, if you select SETUP MODE but really want SIGN ON, press the F1 key to take you back to the previous menu. The F1 key on the Wi-Fi RF Terminal keypad works like the ESC key on the PC – it will usually get you out and back to the previous step.

The entire mode menu can be skipped (see **Chapter 2**; *Wi-Fi System Setup*), causing the Wi-Fi RF Terminal to automatically SIGN-ON when turned-on.

Installing the Wi-Fi RF Terminal Utilities Software

The RF Terminal system ships with a CD of programs for use with the RF Terminal and other Worth Data hardware.
You have the choice of installing the following:

Windows Integrated Utilities

- Installation Test Program
- Voice Prompts Manager
- Programming Examples, and Demos
- Firmware Updater/Loader

ActiveX Tools

- Programmer's Development Tools
- Connection Host software
- Examples

Documentation

- Hardware manual for the 7802 Terminal

Click on the program you wish to install.

To install any of the programs found on the Utilities CD, simply insert the CD into your CDROM drive. The install program should start automatically. If it does not, simply run the SETUP.EXE program found on the CD.

Using the Windows Integrated Hardware Utility

The Integrated Hardware Utility includes software tools, samples, and manuals for the 7802 Terminal.

The Test Program…

Worth Data provides a test server available over the Internet. The Wi-Fi Terminal is shipped with default Connection Host configuration that will connect to our test server once you have configured the Terminal's

WiFi configuration for your LAN/access point. This is a simulated data collection application that can be used to test your installation or to demonstrate how the 7802 Terminal system works. See chapter on *RF System Setup* for more on configuring your Terminal.

As part of the Integrated Utilities, Worth Data also provides a complete stand-alone testing system that will run on your LAN and does not require Internet access. Using this test program requires more detailed configuration of your Terminal(s). Please read the instructions presented in the test program when you run it.

The Voice Manager…

This utility allows you to customize the voice prompts available in the 7802 Terminal for your application.

The Firmware Loader…

The 7802 RF Terminal Firmware Loader program is a part of the Integrated Utilities that allows you to download new RF Terminal firmware from Worth Data into your RF Terminal. New firmware can be obtained on CD ROM directly from Worth Data or downloaded via the Web at:

http://www.barcodehq.com/downloads.html

See **Appendix: *Firmware Upgrades*** for details on how to use the 7802 RF Terminal Firmware Loader program (Windows).

Chapter 2: RF System Setup

The Wi-Fi RF Terminal can be configured using the Wi-Fi RF Terminal Setup menu. Most users do not need to change anything in the setup except for the Wi-Fi settings.

Factory Default RF Terminal Configuration

Parameter	Default Setting	Parameter	Default Setting
Wi-Fi Config	see details below for	**MSI /Plessey Code**	MSI - OFF
	Wi-Fi Configuration settings		MSI with 1 mod 10 - OFF
	and defaults		MSI with 2 mod 10 - OFF
			MSI with mod 11/mod 10 - OFF
			Transmit check digit - 0
			Plessey - OFF
Code 3 of 9	Code 39 - ON	**Codabar**	Codabar - OFF
	Full ASCII - ON		CLSI format - OFF
	Accumulate Mode - ON		START STOP Char - OFF
	Transmit Start Stop - OFF	**Code 128**	Code 128 - ON
	MOD 43 Check Digit - OFF		UCC/EAN-128 - OFF
	Transmit MOD 43 - OFF	**Databar / RSS-14**	Databar / RSS-14 - OFF
	Caps lock - OFF		
	Decode Option - 0		
2 of 5 Code	Interleaved 2 of 5 - OFF	**Code 93 / Code 11**	Code 93 - OFF
	Check Digit - OFF		Code 93 full ASCII - ON
	Transmit Check Digit - OFF		Code 11 - OFF
	Standard 2 of 5 - OFF		Code 11 Check Trans - 0
	2 of 5 Length - 06	**RS-232 I/O Settings**	Baud Rate - 9600
UPC-A EAN 13	UPC/EAN ALL - ON		Parity - none
	Supplements - OFF		Data bits - 8
	UPC-A NSC - ON		XON/XOFF Printer - ON
	UPC-A check digit transmitted - ON	**Time & Date Settings**	Date Format - USA
			Year Output – 2 digits
	EAN-13 country code transmitted - ON		Shut Down Time – 5 min
		Speaker Options	Beep Volume - medium
	EAN-13 Check - ON		Beep Tone - 2
	ISBN EAN-13 mode - OFF		Voice Volume - medium
	UPC-A as EAN-13 - OFF		Keypad Tone - ON
UPC-E EAN 8	UPC-E First Char - OFF	**Laser Options**	Double Decode - OFF
	EAN-8 First Char - ON		4.5 Second Beam - OFF
	UPC-E Check Digit - OFF		Aiming Dot Duration – 0 seconds
	EAN-8 Check Digit - ON		
	UPC-E Expanded Transmission - OFF		
		LCD Settings	
	UPC-E1 - OFF		Background Color – 1 (black)
Other Bar Code Options	Storage Tek Label – OFF		
	LabelCode 5 - OFF		Text Color – 2 (blue)
	LabelCode 4 - OFF		Brightness – medium
	Barcode IDs - OFF		Brightness Timeout – 5 sec

Using the Setup Menu on the RF Terminal

The Wi-Fi RF Terminal can be setup via the Terminals' keypad by entering *Setup* from the menu.

1. - SIGN ON
2. - SETUP
3. - SITE SURVEY

Press the **2** key. The next menu allows you to choose which item to configure:

Wi-Fi TERMINAL SETUP

Wi-Fi CONFIGURATION	**1**
BAR CODE OPTIONS	**2**
RS-232 I/O SETTINGS	**3**
DATE & TIME SETTINGS	**4**
SPEAKER SETTINGS	**5**
LASER SETTINGS	**6**
LCD SETTINGS	**7**
OTHER SETTINGS	**8**
SYSTEM TOOLS	**9**
DONE/EXIT	**0**

Select the option you want to set or verify or press 0 or the F1 key to exit back to the **MODE MENU.**

The groups in the keypad Setup Menu contain the following setup parameters:

Setup Group	Parameter	Setup Group	Parameter
Wi-Fi Setup	Terminal Configuration	**Speaker**	Beep Volume
1	Host Configuration	5	Beep Tone
			Voice Volume
Bar Codes	Code 3 of 9		Keypad Tone
2	UPC-A, EAN 13		
	UPC-E, EAN 8	**Laser**	Double Decode
	Code 128	6	4.5 Second Laserbeam
	2 of 5 Codes		Aiming Dot Duration
	Codabar		
	MSI/ Plessey	**LCD**	
	Code 93 / Code 11	7	
	Databar / RSS / Other		Background Color
			Text Color
RS-232	Baud Rate		Brightness
3	Parity		Brightness Timeout
	Data Bits		
	XON/XOFF Printer	**Other**	Preamble
		8	Postamble
Date/Time	Set Time		Characters
4	Set Date		
	Date Format		
	Year Output		
	Shut Down Time		

Once you have selected a group to edit, you will see each parameter displayed in the order listed above. Use the next section of this chapter as a reference for all Wi-Fi RF Terminal Setup Parameters.

Wi-Fi Configuration

Under Wi-Fi Configuration there are three sections:

Wi-Fi CONFIGURATION

TERMINAL CONFIGURATION	**1**
ACCESS POINT CONFIG	**2**
CONNECTION HOST CONFIG	**3**

Terminal Configuration

DHCP **ON**

Default: **ON**

Description
Sets the Terminal to either obtain and IP address, network mask, gateway, etc. from a DHCP server, or to use static settings that you enter into the Terminal.

DCHP servers typically run on your LAN, not on the internet. Most LANs use a DHCP server. You can see if yours does by looking at the network configuration of your computer; if it is set to "automatic" or similar, chances are you have a DHCP server on your LAN. If you have an installed DSL modem, for example, these typically have a default DHCP server running on them.

Whether you have a DHCP server running on your LAN or not is entirely up to you and is part of your network configuration. If you don't understand what this is, you should consult with a person knowledgeable about your network configuration.

Options
OFF or ON

Terminal IP Address **000.000.000.000**

Default: **000.000.000.000**

Description
If you set DHCP (above) OFF you will need to set a unique static IP address for your Terminal. If you have more than one Terminal, each will require its own unique IP address. Keep in mind that every device and computer on your LAN has its own unique IP address and you will cause problems if any two devices try to use the same IP address. For example enter 192.168.1.12 (do not use leading zeroes, ie. do NOT enter 192.168.001.012).

Be aware that you cannot simply enter any combination of numbers here. First, it must be in the format shown in the default, with four triplets (value from 0 to 255) separated by periods. Do not use leading zeros in the triplets. Also, in order to be visible on your LAN, it must be on the correct "subnet". What subnet you are on is determined in part by your Network Mask, which basically tells you which part of your IP address must be constant, and which can be unique for each device on your LAN. Almost all LANS use a network mask of "255.255.255.0" and IP addresses something like "192.168.1.x". What the network mask with three

“255”s tells us is that all of the IP addresses on your subnet must have the same first three triplets (ie “192.168.1”) and that the fourth triplet can be any value from 1 to 255. All of the devices on your LAN with an IP address that starts with “192.168.1” will be visible to each other. If there is a device with an IP address of “192.16.2.5”, it is on a different subnet and will not be visible to all the “192.168.1.x” devices.

For clues as to what network mask and IP addresses you can use, you can look at the network setting on your computer to see how it is set up.

Of course, by far the easiest way to set this is use DHCP!

Options
A valid IP address of the form 123.456.789.12
Enter the digits leaving out any leading zeros. For example enter 192.168.1.12 not 192.168.001.012.
Value range for each triplet is 0-255.
Interacts with “Network Mask” setting below. See comments in Description above.

Network Mask **255.255.255.000**

Default: **255.255.255.000**

Description
If you set DHCP (above) OFF you will need to determine and set the proper Network Mask for you LAN.

Network Mask helps to determine the subnet your LAN is operating on. All devices on your LAN must have the same Network Mask setting in order to be visible to each other. Read the description in Terminal IP Address above for more on Network Masks and Subnets.

The Network Mask is entered in exactly the same form as an IP address, with 4 triplets separated by periods.

If you are unsure of what you are doing, don't change anything until you consult with someone knowledgeable in network addressing.

As an interesting aside, yes, you can have multiple subnets all operating on the same physical network, all running independently and invisible to each other.

Options
A valid IP number of the form 255.255.254.0
Enter the digits leaving out any leading zeros. For example enter 192.168.1.12 not 192.168.001.012.
Value range for each triplet is 0-255.
Interacts with “IP Address” setting above. See comments in IP Address Description above.

Gateway IP Address **000.000.000.000**

Default: **000.000.000.000**

Description
The gateway IP address is required if the Terminal will be communicating outside of your local LAN, that is, if the Terminal will be connecting with a Connection Host running on the internet or another subnet.

The gateway IP address is generally the IP address of your DSL or cable modem/router on your LAN.

Options
In most cases, the gateway address is supplied by a DHCP server, but if not you can enter one. A typical address is 192.168.0.1; you can check your computer settings and match that.

DNS Server IP Address **000.000.000.000**

Default: **000.000.000.000**

Description
A **DNS server** is any computer registered to join the **D**omain **N**ame **S**ystem. A DNS server runs special-purpose networking software, features a public IP address, and contains a database of network names and addresses for other Internet hosts.

A DNS server is usually hosted by an internet service provider, running on the internet. It is possible you have a local DNS server running on your LAN (but if you do you probably know exactly what you are doing and don't need to read this).

DNS servers resolve website names like "www.barcodehq.com" into an actual internet address code (an IP address) like "**68.142.213.151**". You can see that the IP address works just like the name by entering the IP address in your browser.

Options
If your Connection Host address is a name rather than an IP address number, then you will need to make sure you have specified the DNS Server Address.

If you have DHCP enabled, most DHCP servers provide the DNS server setting. If you are not using DHCP, the easiest way to find out your DNS server address is to review your computer's network summary details.

If you are having difficulty determining what you need to put here, or finding the DNS server address setting on your computer, you will need to consult with someone familiar with these settings.

Access Point Configuration

SSID **<blank>**

Default: **<blank>**

Description
The SSID, or **S**ervice **S**et **ID**entification, is the code name your WiFi router broadcasts to identify the name of the network it supports. Some installation "hide" the SSID, that is the WiFi router is set to not broadcast it. In this case, you still need to know what it is.

Options
Set the SSID to match the SSID of the network that the Terminal will be connected to. If the SSID is not

hidden, you can use the **SITE SURVEY** command at the opening screen to find the SSID of Wi-Fi networks that are in range.

The SSID must be entered in the Terminal EXACTLY as it is set in the WiFi router (and as shown in the Site Survey described above). This means all upper- and lower-case letters and number must match exactly.

When setting the SSID the cursor will change to a white box. Press the light blue shift key to enter upper-case alpha characters. Press the F2 to toggle upper and lower-case entry. The red cursor is for upper-case, the yellow cursor is for lower-case and the white cursor is for non-shifted characters from the number pad.

SECURITY **NONE**

Default: **NONE**

Description
Security is the encryption method used by your WiFi router/access point to protect transmitted and received data from unauthorized monitoring. By default, most access points are set to use no encryption.

The SECURITY setting in your Terminal must match the security set in your WiFi access point that the Terminal will be communicating with.

The configuration system for most access point will have encryption descriptions that do not match exactly the choices provided in the Terminal. Some access points will support encryption modes that the Terminal does not support, and vice-versa.

Options

NONE
WEP-128
WPA1-PSK-TKIP
WPA-PSK (mixed WPA1 and WPA2)
WPA2-PSK-AES

The default is no security. WEP-128 only supports Open System Authentication. Pressing the 4 key will toggle through the available choices. WPA1 and WPA2 are the most common types. If you are unsure, try what appears to most closely match your access point setting. If you experience problems, try temporarily turning off security on your access point and Terminal to make sure security issues are not preventing a connection.

KEY/PHRASE **<blank>**

Default: **<blank>**

Description
This is the security "password" to match the setting in your WiFi access point.

Options
For WEP-128 enter the hex key. For WPA enter the pass phrase. See the above "SSID" for how to enter

upper- and lower-case characters.

Connection Host Configuration

Connection Host URL **www.worthdata.net/server/cloud.php**

Default: **www.worthdata.net/server/cloud.php**

Description
This is the web address/URL or IP address (must have DNS Server set if using a URL) where a Connection Host is running.

The Connection Host program can be running on a computer on your LAN , in which case you will use the IP address of the computer running the Connection Host program, or the Connection Host can be running on a web server, in which case you can use either an IP address or the URL of the web server Connection Host an IP address.

This can also be the web address/URL of an integrated web-based application, or "Cloud Server" that wraps the function of the Connection Host and a task-specific data-driven custom application all in one. The default setting on your Terminal points to a demonstration Cloud Server on the Worth Data website.

Complete source code for both the demo Cloud Server and the web-based Connection Host are provided with your Terminal.

Options
Worth Data provides a web-based Connection Host that you can use at

www.worthdata.net/connect/terminal.php

A Windows-based Connection Host program that you can install on a computer on your LAN for a completely local solution is also provided with the Terminal.

Set this to the address/URL of a Cloud Server or the terminal interface of a Connection Host located on the Internet (web-based)
or
Set this to the IP address on your LAN of the Windows Connection Host application.

Keep in mind that the web-based solutions can also be run on a private/local web server such as Apache or IIS, if you have one available and the resources to configure it.

Leave out any leading zeros. For example enter 192.168.1.5 not 192.168.001.005.

Connection Host Port Number **80**

Default: **80**

Description

The Port Number is part of the address of the Connection Host and is used in addition to the Connection Host URL above. Think of the port number as like a PO Box number in a mailing address.

By using different ports, a single computer running on a single IP address can support multiple server functions, for example it can be an FTP server (port 21), an HTTP web server (port 80), a telnet server (port 23), a SMTP mail server (port 25), etc.

Options
The default setting of 80 allows the Terminal to connect with Worth Data's demo “cloud application” running on the worthdata.net website. If you are running your own web-based connection host or cloud server, you will probably want to use 80 as well.

If you want to use the Windows-based Connection Host program running on your LAN, you will probably need to use a port other than 80 (current versions of Windows typically prevent application from using port 80). When you run our Windows-based demos, port 8080 is suggested and used by default.

In general, set the Host Port Number to match the port being used by the Connection Host. If you are running the Connection Host program locally on your LAN rather than using the Worth Data internet-based connection host or your own internet-based connection host installed on your web site, this will need to be set to other than 80 (try 8080 and the Connection Host program set to match). Otherwise, do not change unless you know exactly what you are doing.

User Name **demo**

Default: **demo**

Description
Part of Application Server access key system. In order to connect with an Application Server, settings for User Name, Server ID, and Password must all be set identically in the Application Server and all Terminals that use this Application Server.

The Connection Host does not use this setting and simply passes the User Name on to connected Terminals and Application Servers.

Note: Application Servers are custom programs you build using the provided ActiveX control. “User Name” is one of the required properties to set in the ActiveX control.

Options
Enter any text you like here (up to 12 characters), as long as exactly the same User Name is set in the Application Server you want the Terminal to connect with.

Password **password**

Default: **password**

Description
Part of Application Server access key system. In order to connect with an Application Server, settings for User Name, Server ID, and Password must all be set identically in the Application Server and all Terminals

that use this Application Server.

The Connection Host does not use this setting and simply passes the User Name on to connected Terminals and Application Servers.

Note: Application Servers are custom programs you build using the provided ActiveX control. “Password” is one of the required properties to set in the ActiveX control.

Options
Enter any text you like here (up to 12 characters), as long as exactly the same Password is set in the Application Server you want the Terminal to connect with.

Server ID **Worth Data Demo**

Default: **Worth Data Demo**

Description
Part of Application Server access key system. In order to connect with an Application Server, settings for User Name, Server ID, and Password must all be set identically in the Application Server and all Terminals that use this Application Server.

The Connection Host does not use this setting and simply passes the Server ID on to connected Terminals and Application Servers.

Note: Application Servers are custom programs you build using the provided ActiveX control. “Server ID” is one of the required properties to set in the ActiveX control.

Options
Enter any text you like here (up to 12 characters), as long as exactly the same Server ID is set in the Application Server you want the Terminal to connect with.

Rev. 100 Mode

Default: OFF

Description
Allows compatibility with earlier versions of the 802 and 7802 “version 100” Terminals. These terminals use a different communication protocol that the current 7802 WiFi Terminals and require the version 1 Windows-based Connection Host. Early version Terminals cannot use the web-based Connection Host.

The ActiveX component used by these earlier version Terminals is also different, though the programming interface is almost identical and the old and new ActiveX components can be installed and run together in your Server Application thus allowing you to run old and new Terminals together.

The rev. 100 mode uses a completely different protocol to communicate with the Connection Host (must be a version 1 Connection Host) and Application Server, relying on UDP broadcast and proprietary handshaking routines.

The normal operating mode of the 7802 terminal (with rev. 100 mode turned OFF) uses standard TCP connections and HTTP data formatting.

Rev. 100 mode is intended ONLY FOR BACKWARD COMPATIBILITY and should NOT be used for developing new applications. Existing applications that use the older terminals can be easily ported to accommodate both old and new 7802 terminals. Please review the sample applications, ActiveX programming tools, and documentation that comes with your 7802 terminal.

Options

Set Revision 100 Compatibility Mode for the terminal to operate as an original “802” terminal or as a “rev. 100” (first edition) version of the 7802 terminal.

Bar Code Options

Code 3 of 9 (Code 39)

Code 3 of 9	**ON**	OFF	**1**
Full ASCII	**ON**	OFF	**2**
Accumulate Mode	**ON**	OFF	**3**
Transmit Start Stop	ON	**OFF**	**4**
MOD 43 Check Digit	ON	**OFF**	**5**
Transmit MOD 43	ON	**OFF**	**6**
Caps Lock	ON	**OFF**	**7**
Decode Option	**0**, 1, 2		**8**

- The Start and Stop character for Code 39 is the * character. Setting 4 determines whether or not those characters are transmitted to the computer along with the data. For example, at setting ON, the data of 1234 would be transmitted as *1234*. Transmitting the start and stop characters can be useful if you need to differentiate between data that comes from a bar code versus data coming from the keypad.

- Enabling use of the Mod 43 check character requires that the last character of your bar code conform to the Mod 43 check character specifications. See ***Appendix: Code 39*** for more information. Enable transmission (6) will send the check digit data along with the rest of the bar code data to your computer. To use 6, you must also be using 5.

- Caps Lock ON causes lower case letters read as data to be transmitted to the computer as UPPER CASE, and upper case letters to be transmitted as LOWER CASE. Numbers, punctuation and control characters are not affected. Caps Lock OFF means that letters will be transmitted exactly as read. This setting applies to all bar code types.

- See ***Appendix: Code 39*** for more information regarding Accumulate Mode.

- Decode Option is used to allow reading of Code 39 bar codes through a windshield. Setting this option to 1 will loosen up the decoder a little and option 2 will loosen up the decoder a bit more. This should be used with caution since using a looser decoder can cause substitutions.

UPC-A / EAN-13

UPC/EAN ALL	**ON**	OFF	**1**
UPC/EAN Supplements	ON	**OFF**	**2**
UPC-A NSC	**ON**	OFF	**3**
UPC-A Check	**ON**	OFF	**4**
EAN-13 First 2 Digits	ON	**OFF**	**5**
EAN-13 Check	**ON**	OFF	**6**
ISBN EAN-13 Mode	ON	**OFF**	**7**
UPC-A as EAN-13	ON	**OFF**	**8**

- Use setting 2 to enable reading of the 2 and 5 digit UPC/EAN supplements commonly found on magazines and paperback books as well as the Extended Coupon Codes. Using this setting force left to right reading of UPC codes to assure that the supplement code is not missed.

- Use setting 3 to enable transmission of the NSC character to your computer. The Number System Character is the leading character in the bar code. For details, see ***Appendix: UPC/EAN***.

- Use setting 4 to enable transmission of the check digit character to your computer. The check digit is the last character and is based upon a calculation performed on the other characters.

- Use setting 5 to enable the transmission of the EAN-13 country code (the first 2 digits).
- Use setting 6 to enable the transmission of the EAN-13 check digit.
- ISBN (International Standard Book Numbering) bar codes are EAN-13 with a 5-digit supplement. If the "Bookland" bar code uses 978 (books) or 977 (periodicals) as the first three digits, then the RF Terminal can transmit it in the ISBN format. To enable transmission of the ISBN format, set option 7 to ON. To return to the default of normal EAN-13 transmission, set option 7 to OFF. For details on ISBN, see ***Appendix: UPC/EAN***.
- UPC-A can be transmitted in EAN-13 format by adding a leading 0 (USA county code) to the UPC-A data. To transmit in EAN-13 format, set option 8 to ON.

UPC-E / EAN-8

UPC-E First Digit	ON	**OFF**	**1**
EAN-8 First Digit	ON	**OFF**	**2**
UPC-E Check Digit	ON	**OFF**	**3**
EAN-8 Check Digit	ON	**OFF**	**4**
UPC-E Expanded	ON	**OFF**	**5**
UPC-E1	ON	**OFF**	**6**

- Use setting 1 and 2 to enable or disable the UPC-E or EAN-8 first digit.
- Use setting 3 and 4 to enable or disable the UPC-E or EAN-8 check digit. The check digit is the last character and is based upon a calculation performed on the other characters.
- Use setting 5 to select UPC-E0 compressed or expanded. When set to ON (the default setting) UPC-E1 codes are transmitted as is, when set to OFF UPC-E1 codes are transmitted with inserted zeros to make them the same length as a UPC-A bar code. An NSC of 0 is assumed.
- Use setting 6 to enable the reading of UPC-E1 bar codes. Do not enable UPC-E1 if you plan on reading EAN-13 bar codes. You may experience partial reads when reading ENA-13.
- If you prefer to transmit UPC-E bar codes in a 6-digit format while EAN-8 is transmitted in its original 8-digit format, set option 7 to ON.

Code 128

Code 128	**ON**	OFF	**1**
UCC/EAN 128	ON	**OFF**	**2**

- UCC/EAN-128 is a subset of Code 128 that follows certain specifications regarding character content, length and check digits. Enabling UCC/EAN-128 (**2**) causes the RF Terminal to look for a Code 128 bar code that begins with the Code 128 F1 (Function 1) character. See **Appendix: *Code 128*** for more details.

Codabar

Codabar	ON	**OFF**	**1**
Codabar CLSI	ON	**OFF**	**2**
Start Stop Character	ON	**OFF**	**3**

- CLSI is a form of Codabar often used by libraries.

- Setting **3** will transmit the Codabar *start* and *stop* characters with the bar code data to your computer. If you are varying the start and stop characters to differentiate between different labels, transmitting the start and stop can be helpful. See **Appendix: *Codabar*** for more information.

2 of 5 Code

Interleaved 2 of 5	ON	**OFF**	**1**
Check Digit	ON	**OFF**	**2**
Transmit Check Digit	ON	**OFF**	**3**
Standard 2 of 5	ON	**OFF**	**4**
2 of 5 Code Length		**06**	**5**

- Setting **2** requires that the last digit in your bar code conform to the specifications for the 2 of 5 check digit calculation. See **Appendix: *2 of 5 Code*** for more information.
- Transmission of the check digit (**3**) requires the use of setting **2** and will transmit the check digit along with the bar code data to the computer.
- 2 of 5 is so susceptible to misreads that the RF Terminal adds an additional safeguard - it can be configured to look for fixed-length data only.
- The default setting of **06** causes the RF Terminal to read **only** 2 of 5 codes that are 6 digits in length. To set the RF Terminal to read a different length, enter any two-digit number. 2 of 5 code must always be an even number of digits so the length setting must always be an even number.
- Reading variable length I 2of5 or 2 of 5 codes is to be avoided if at all possible. The **00** setting is supplied for the purposes of reading codes of unknown length, counting the digits and setting the length to the proper number.

MSI and Plessey

MSI/Plessey	ON	**OFF**	**1**
MSI/Plessey-Single Mod 10 Check Digit	ON	**OFF**	**1**
MSI/Plessey-Double Mod 10 Check Digit	ON	**OFF**	**1**
MSI/Plessey-Single Mod 11/Single Mod 10 Check	ON	**OFF**	**1**
Enable Plessey / Disable MSI	ON	**OFF**	**1**
Transmit Check Digits	**0**, 1 or 2		**2**

- The MSI/Plessey options are selected by pressing the **1** key to select the desired mode of operation.
- If you have enabled the Mod 10 or Mod 11 check digits, they will be transmitted along with your bar code data from the RF Terminal to your host.
- For more information regarding MSI or Plessey Code, see **Appendix: *MSI Plessey Code***.

Code 93 / Code 11

Code 93	ON	**OFF**	**1**
Code 93 Full ASCII	**ON**	OFF	**2**
Code 11	ON	**OFF**	**3**
Code 11 Check Digit Transmission	**0**, 1 or 2		**4**

- Code 93 is similar in character set to Code 39. See **Appendix: *Code 93*** for more information. Code 93 is not a

commonly used bar code symbology.

DataBar / RSS-14 Options

DataBar / RSS-14	ON	**OFF**	**1**
DataBar / RSS-14 plus Identifiers	ON	**OFF**	**1**
DataBar / RSS-14 plus UCC-128 Format	ON	**OFF**	**1**

By default, DataBar / RSS-14 is disabled. Press the **1** key to toggle through the DataBar / RSS-14 options listed above. We support the standard and stacked version of DataBar / RSS-14.

For more information on GS1 DataBar, see the GS1.org website at

http://www.gs1.org/productssolutions/barcodes/databar/

Other Bar Code Options

Storage Tek Label	ON	**OFF**	**2**
LabelCode 5	ON	**OFF**	**3**
LabelCode 4	ON	**OFF**	**4**
Bar Code IDs	ON	**OFF**	**5**

The Storage Tek Tape Label code is a proprietary variation of Code 39 code used for the storage of computer data tapes. Enabling the tape label code does not disable reading of Code 128 or Code 39 bar codes.

LabelCode 5 and LabelCode 4 are proprietary bar code types used by Follet.

Bar Code ID's are characters assigned to each bar code type to identify that particular type of code. These Bar Code IDs can output as prefix to the bar code data to identify what type of bar code you are using. The Bar Code ID's are assigned as follows:

Bar Code	ID	Bar Code	ID	Bar Code	ID	Bar Code	ID
Codabar	a	2 of 5	f	UPC-E (1)	o	LabelCode 4	y
Code 39	b	Code 128	g	EAN-8	p	LabelCode 5	z
UPC-A	c	Code 93	i	RSS-14	r		
EAN-13	d	MSI	j	StorageTek	s		
I 2of 5	e	UPC-E(0)	n	Plessey	x		

The ID character is transmitted in front of the bar code data.

RS-232 Settings:

Baud Rate

Use the 1 key to select the baud rate. The default value is 9600. The available baud rates are 2400, 4800, 9600, 19200, 38400, 57600 and 115200.

Parity

- Use the **2** key to select the parity.
- The options are **None,** Even or Odd.
- **None** is generally used with 8 data bits
- Even or Odd parity is generally used with 7 data bits.

Data Bits

Use the **3** key to select either **8** or 7 data bits.

XON / XOFF Printer

- Setting **4** pertains to use of a *serial Printer* with your RF Terminal. Use key **4** to enable **XON / XOFF** if your *serial Printer* supports it. It DOES NOT apply to the Cameo and QL3 Printers.
- Settings **E** and **F** pertain to the way the RF Terminal handles illegal statements coming from the host computer. RF Terminal software versions ***prior*** to 9.059 did not handle illegal statements the same way as current versions. ***This setting is really only applicable if you had written your host program to be compatible with RF Terminal versions prior to RFT9059.***

Bluetooth Settings:

The Bluetooth Settings menu has 4 options that allow the LT7802B to pair with other Bluetooth devices. Currently only the Serial Port Profile (SPP) is supported. This is the most common profile for serial cable replacement and is typically used for Bluetooth enabled printers.

Bluetooth Interface (On/**Off**)

This setting controls the power to the Bluetooth module and also sets the operation of the "S" command. The Bluetooth interface is **Off** by default and must be set to On to use the Bluetooth module. The "S" command will send data to the RS-232 port when the Bluetooth Interface is set to **Off**. The "S" command will send data to the Bluetooth module when the Bluetooth Interface is set to On.

Add New Devices

Use this command to add a new Bluetooth device. The LT7802B can have up to 5 "known" devices at one time and paired with 1 device at a time. The "Add New Devices" screen shows up to 5 devices that have been added at the top of the screen and the names of up to 5 "found" Bluetooth devices at the bottom of the screen. When the "Add New Devices" option is selected the LT7802B will scan for active Bluetooth devices. You must make your Bluetooth device "discoverable" before the option is selected for the device to be found. Consult the manual for your Bluetooth device to find out how to make it "discoverable". You can select any of the "found" devices to add to the list of known Bluetooth devices. If the LT7802B is currently paired with a previously found Bluetooth device then (**PAIRED**) will appear next to the name of that device. The LT7802B can only pair with one device at a time. You must pair the LT7002 with a Bluetooth device before you can send data to that device.

Delete/View Devices

This command is used to see what Bluetooth devices are "known" by the LT7802B and delete them from the list of known devices. If one of the devices is paired with the LT7802B then (**PAIRED**) will appear next to that device. This is a quick way to see what device, if any, is currently paired with the LT7802B.

Pair with Existing Device

Use this command to pair the LT7802B with a Bluetooth device that has been found using the "**Add New Device**" command. You must add the device before you can pair with the device. A list of previously "found" devices will be displayed and the currently paired device, if any, will be indicated with (**PAIRED**). Select the device that you would like to pair with or press 0 to exit and make no change.

The LT7802B will attempt to pair with the Bluetooth device when the S-command is sent so make sure that your Bluetooth device is powered up and ready at that time.

Date & Time Setting

Set Time

The time is set using a 4-digit military **hhmm** format. For example, to set the time to 3:08 p.m., you would enter **1508.** To display the time during operation, press the STATUS key.

Set Date

For correct date display, the 6-digit date must be set in the date format you plan to use. By default the US terminals use the US date format of **dd/mm/yy**. If you change the date format, you must re-set the date to match the new format. For example, to set a date of January 20, 2009, you would enter 012009 (US format) or 200109 (European format). To display the date during operation, press the STATUS key.

Date Format

US Format	**0**
European Format	1

- The US format of **mm/dd/yy** is the default setting.
- If you switch formats, you must reset the date (SET DATE) in the new format also.

Year Output

2 digit	**0**
4 digit	1

- By default, the RF Terminal is configured to display and transmit the year in a **2-digit format**; i.e. 2009 would transmit and display as 0**9**.
- *Before* you change the RF Terminal to display a 4-digit year, i.e. **2009**, make sure that the software receiving data from the RF Terminal is set up to accept a 4-digit year.

Shut Down Time

By default, if the RF Terminal is inactive (no keystrokes or scanning) for more than 5 minutes, it will shut itself down in order to conserve batteries. This includes SIGNING OFF if appropriate. To resume

operation, you must turn the RF Terminal back on using the ON/OFF key. To change the amount of time the RF Terminal waits before shutting down enter two digits - the default is 05 (5 minutes)- to correspond to the length of time in minutes. For example, 01 would be 1 minute. ***Setting the Shut Down Time to 00 will disable automatic shutdown***.

Speaker Settings

Beep Volume

OFF	**1**
Low	**1**
2	**1**
3	**1**
4	**1**
Medium	**1**
6	**1**
7	**1**
8	**1**
High	**1**

The default volume of the "Beep" is Medium. Each time you press the "1" key you will hear a beep at the different volume settings. When you are happy with the loudness of the beep tone, press 0 or F1 to exit.

Beep Tone

1 - Lowest	**2**
2 - Low	**2**
3 - Medium	**2**
4 - High	**2**
5 - Highest	**2**

The default beep tone is **3 – Medium.** Each time you press the "**2**" key you will hear a beep at various tones. When you are happy with the tone of the beep, press 0 or F1 to exit.

Voice Volume

OFF	**3**
Low	**3**
2	**3**
3	**3**
4	**3**
Medium	**3**
6	**3**
7	**3**
8	**3**
High	**3**

The default volume of the "Voice" is **Medium.** Unless you need very loud voice prompts you should use the medium setting to conserve battery power. When you are happy with the loudness of the beep tone, press 0 or F1 to exit.

Keypad Tone

Keypad Tone	**ON**	OFF	**4**

The "**Keypad Tone"** is the key click that you hear each time a key is pressed. Press the "**4**" key to toggle this On and Off.

Laser Options

Double Decode

Double Decode ON **OFF** **1**

- **Double Decode** is there to minimize the possibility of misreads when scanning very poor quality bar codes. This option forces the RF Terminal to keep reading until it gets two results that are identical. This "double scan checking" takes longer but will minimize misreads since it must get the same result twice before considering it a "good" read.

4.5 Second Laser Beam

4.5 Second Laser Beam ON **OFF** **2**

- **4.5-second laser beam** increases the amount of time the laser beam is activated, giving the laser more time to try and read a code. This option is useful for trying to read poor quality code. The default beam time is 2 seconds.

Aiming Dot Duration

Aiming Dot Duration (in 1/10 seconds) **00** – 99 **3**

- This parameter applies to the built-in internal laser. Before the laser beam spreads, you can create a brighter aiming dot to be sure you are on the bar code you want to read. The default is set to 00, no aiming dot. You can key in 01 through 99 which creates an aiming dot in 1/10th second increments; i.e., 20 would be two seconds.

LCD Options

Background Color

Background Color 0, **1**, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F **2**

The default background color can be set to one of 16 different values. Each time you press the "**2**" key a small rectangle will show the selected background color with the current text color. The default value is **1** for **Black.** You can find more information about colors in chapter X.

Text Color

Text Color 0, 1, **2**, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F **3**

The default text color can be set to one of 16 different values. Each time you press the "**3**" key a small rectangle will show the selected text color with the current background color. The default value is **2** for **Blue.** You can find more information about colors in chapter X.

Brightness

Brightness LOW, **MED**, HIGH

The default brightness of the LCD is medium which works well for indoor use. In high ambient light areas, like outdoors, you may want to increase the brightness of the display. Increasing brightness shortens battery life.

Brightness Timeout

Brightness Timeout (in seconds)	00..**05**..99

This setting controls the timeout for the display to dim after a key is pressed or data is displayed on the LCD. The dim setting is the same as the LOW brightness setting so if you have the brightness above set to LOW you will not see any effect from the timeout. Dimming the display helps extend battery life. The default is **05** for 5 seconds. A setting of 00 will disable the timeout and keep the display always at the standard brightness level.

Other Settings

Preamble

Preambles are user-defined data that is attached to the beginning of data (bar code or keyed) that is transmitted to the host by the RF Terminal. For example, if you set a preamble of **@@** and scanned bar code data of **12345**, **@@12345** would be transmitted to the host.

By default, the RF Terminal has no preambles configured. Preambles can contain up to 15 characters entered from the keypad or scanned from the bar coded FULL ASCII Menu. **To set a preamble:**

1. Select option "**8"** from the **RF Terminal** Setup menu then "**1"** for **Preamble** from the **Other Settings** menu.
2. Enter the desired characters (up to 15). Pressing the shift key will turn the cursor red to indicate that the shift is active. Pressing shift again will turn the cursor white and return to unshifted mode.
3. Press "**ENTER"**.when you are finished entering data.
4. To clear the **Preamble** and return to the default (no Preamble defined), press "**CLEAR"**.

You can use the **Preamble** to trim characters from the data you are entering into the RF Terminal. You can trim from 1-15 characters from the data by creating a preamble of:

~x

where ~ is ASCII 126 and ***x*** is a single hex digit 1-F (corresponding to 1-15). Data that is shorter than the trim amount is transmitted without trimming. **Preambles** trim characters from the front of the data. Here are some examples:

Data	Preamble	Data Transmitted
123	XYZ	XYZ123
12345678	~3XYZ	XYZ45678
12345678	~9	12345678
12345678901	~A	1
123456	~5	6

Preamble trims leading characters

Using the Bar Code ID feature and the **Preamble**, you can trim data selectively, trimming characters only on the bar code type specified. To use selective trimming, enter:

~bx

where *b* is the Bar Code ID character (see the *Code 128 setup parameter*) and *x* is the number of characters to

trim from the front of the data. For example, **~b2~c1** says "trim 2 characters from Code 39 data and 1 character from UPC-A data". Remember that the **Preamble** trims leading data. This applies to One-Way and host prompted communication.

Lastly, the **Preamble** can be used to check a minimum/maximum data length for bar code data entered. To check for bar code length in the **Preamble** enter:

|nnmm

where | is ASCII 124, *nn* is the two-digit minimum and *mm* is the two-digit maximum. |0210 would check for a minimum of 2 characters and a maxi-mum of 10. If you try to scan a bar code outside the minimum or maximum lengths, no decode will result. Entering data by keypad is not affected.

Postamble

Postambles are user-defined data that is attached to the end of data (bar code or keyed) that is transmitted to the host by the RF Terminal. For example, if you set a Postamble of **@@** and scanned bar code data of **12345**, **12345@@** would be transmitted to the host.

- By default, the RF Terminal has no Postambles configured. Postambles can contain up to 15 characters. **To set a Postamble:**

  1 Select option "**8"** from the **RF Terminal** Setup menu then "**2"** for **Postamble** from the **Other Settings** menu.

  2 Enter the desired characters (up to 15). Pressing the shift key will turn the cursor red to indicate that the shift is active. Pressing shift again will turn the cursor white and return to unshifted mode..

  3 Press "ENTER".when you are finished entering data.

- To clear the **Postamble** and return to the default (no Postamble defined), press "**CLEAR"**.

- You can use the **Postamble** to trim characters from the data you are entering into the RF Terminal. You can trim from 1-15 characters from the data by creating a Postamble of:

~x

where ~ is ASCII 126 and x is a single hex digit 1-F (corresponding to 1-15). Data that is shorter than the trim amount is transmitted without trimming. Postambles trim characters from the end of the data. Here are some examples:

Data	Postamble	Data Transmitted
123	XYZ	123XYZ
12345678	~3XYZ	12345XYZ
12345678	~9	12345678
12345678901	~A	1
123456	~5	1

Postamble trims trailing characters

- Using the Bar Code ID feature and the **Postamble**, you can trim data selectively, trimming characters only on the bar code type specified. To use selective trimming, enter:

~bx

where ***b*** is the *Bar Code ID character* (see the *Code 128 setup parameter*) and ***x*** is the number of characters to trim from the end of the data. For example, **~b2~c1** says "trim 2 characters from Code 39 data and 1 character from UPC-A data". Remember that the **Postamble** trims trailing data.

- Lastly, the **Postamble** can be used to check a maximum character length for data entered. To check for length in the **Postamble**, enter:

  |*nnmm*

  where | is ASCII 124, *nn* is the two-digit minimum and *mm* is the two-digit maximum. |0210 would check for a minimum of 2 characters and a maximum of 10 If you try to scan a bar code outside the minimum or maximum lengths, no decode will result. Entering data by keypad is not affected.

Characters

This setting allows the RF Terminal to output chosen ASCII characters in place of the actual characters entered. For example, if you scanned the number **1** (*hex 31*) and wanted the RF Terminal to output *hex 92* instead, you would enter ***3192*** for the **Characters** parameter. This would re-assign the output characters, with the RF Terminal outputting *hex 92* every time it sees *hex 31*. To re-assign characters:

- Select option "**8**" from the **RF Terminal Setup** menu then "**3**" to enable character entry. A square cursor will appear.
- Enter up to seven 4-digit pairings where the first 2 digits represent the hex number to *replace* and the second 2 digits represent the hex number to *insert*. You can have up to seven character reassignments.
- Press **"Enter**" when done or "**Clear**" to reset to none.

You can eliminate the output of a character by using ***FF*** as the hex number to insert. For example, if you wanted to eliminate all **$**, following the above instructions, enter ***24FF***.

System Tools

Download File

This will allow you to update the terminal's voice prompts when using the 7802 RF Terminal Voice Prompts Manager program.

Play Voice Prompt

To play a voice prompt, select option "**2**" then enter the 2-digit number of the voice prompt that you wish to play. The valid range is 01 to 99.

Reset to Factory Default

Select option "**3**" to reset all setup values to the factory default values. This will reset all values in all menus of the **RF TERMINAL SETUP**.

Host Interface

Select option 4 to toggle between USB and Serial interface. This only applies to the host interface for firmware updates and voice prompt file downloads. The default is USB.

Chapter 3: Operational Theory

Before you jump in and start writing a complex host program, it is a good idea to be familiar with the theory behind the operation of your 7802 RF Terminal.

System Components

The essential parts of the 7802 WiFi Terminal system are

- One or more *7802 Terminals*
- One or more *Access Points,* mobile or on a LAN, with Internet access

and

- The *Connection Host* software running on a Web Server
- And an *Application Server* running on a Windows computer with Internet access

or

- The *Connection Host* program running on a Windows computer on your LAN
- And an *Application Server* running on a Windows computer with LAN access (can be the same computer running the Connection Host program)

or

- A "Cloud" web-based application server (no Connection Host required)

All communication between the parts of the 7802 Terminal system is through standard TCP/IP connections over your ethernet LAN/WAN.

The 7802 Terminals require a standard wireless access point. This can be a wireless access point installed on your LAN, a public "hot-spot", a mobile (cellular) access point, etc.

The **Application Server** is a user-written program built using the WD7802term ActiveX control that runs on a Windows computer with Internet access. It is also possible to create your own Application Server without using the ActiveX control, but this is challenging and requires advanced programming skills.

The **Connection Host** program is the "hub" of the system. It serves as a relay and brokers information flow between the Terminals and the Application Server. All Terminals and the Application Server connect to the Connection Host over the Internet. The Connection Host is a program provided by Worth Data that can run on a standard Windows computer or as a PHP script on a standard Web hosting server (Apache, IIS, etc.). There is also the default Connection Host, that is already running and provided by Worth Data, that is located at http://www.worthdata.net

A **"Cloud" web-based application** is also possible by writing an application server that resides on a web server. A web-based application server does not require a Connection Host. Worth Data provides a working demo of this along with full source code, in fact your Terminal's default settings are for this located at http://www.worthdata.net/server

Architecture

There are two ways to describe the 7802 Terminal System. The first is “Physical” architecture, that is the way the parts of the system actually hook together; and the second is the “Logical” architecture which describes the information flow between the parts of the system.

Physical

The 7802 Terminals always connect to a wireless access point to become part of a LAN. In order for the Terminal to have Internet access, the LAN that it connects to must provide it.

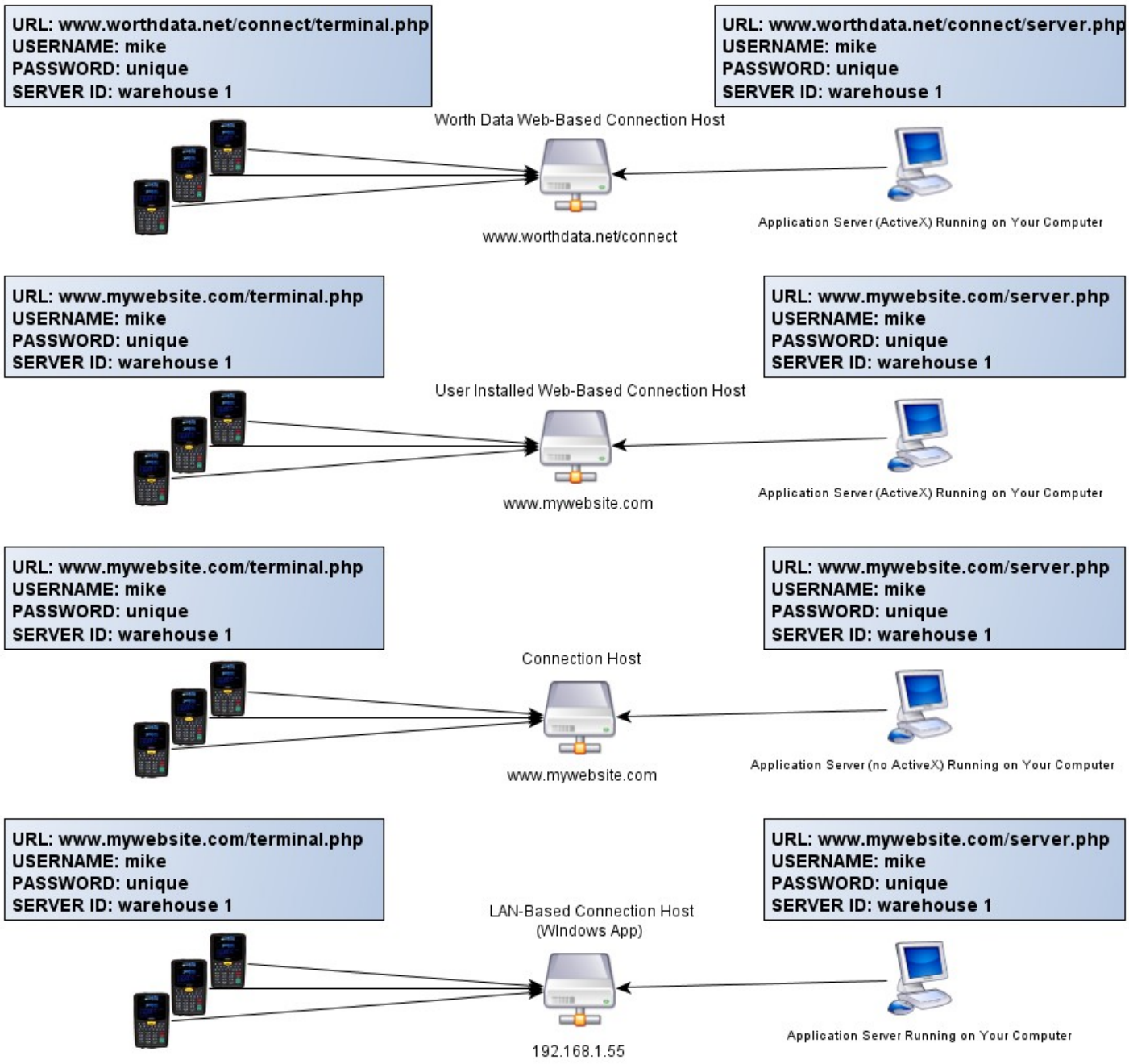
A web-based **Connection Host** always runs on a web server that supports PHP scripting and MySQL database. Typically this would be on your web site host's server and set up as part of your web site; or it can be installed on a web server that is part of your LAN. A typical web server is Apache or IIS with appropriate PHP and MySQL modules.

Setting up your own web-based Connection Host requires basic knowledge of web server and PHP script installation.

You can also use the web-based Connection Host provided by Worth Data (terminal's default configuration is set for this) but be aware this is a shared non-customizable resource intended for demonstration (not production) and Worth Data makes no guaranties about availability or up-time.

Another possibility is to use the Windows-based Connection Host program provided with your Terminal. This software is a Windows program that you install and run on a Windows computer attached to your LAN. It is essentially a custom web server designed specifically to function as a local LAN-based Connection Host for your Terminals with no Internet connectivity or access required; your LAN is used as a private “internet”.

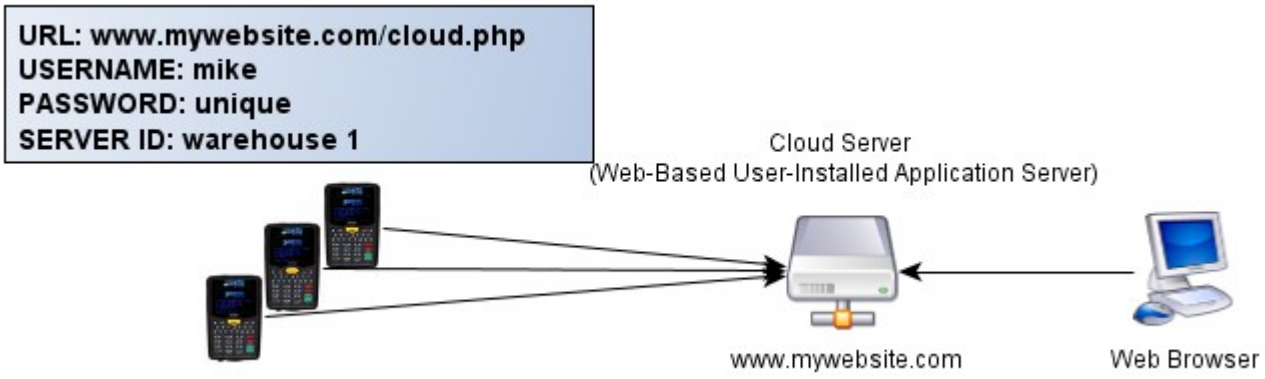
Communication Diagrams for Using a Connection Host



An **Application Server** can run on any computer with access to the Internet. Worth Data provides programming tools for creating Windows Application Servers, but you could also create your own that runs on other platforms (Linux, Apple, etc.).

A **"Cloud" web-based application** server is essentially a special website installed on a web server. Typically it would be created as a script, written in PHP or ASP or whatever language is your favorite. It uses the web server's database "backend" to store data collected by Terminals and to store information on how the Terminals should behave (what their data-collection routine is). This approach could be used to integrate portable terminal data collection with your existing web-based application.

Communication Diagram for Using a "Cloud" Application Server



Worth Data provides full demos with source code for both the Connection Host and "Cloud" approach. These are installed with the utility software or download them from www.worthdata.net

You can see that there a numerous ways that the necessary connectivity can be achieved. The bottom line here is that, depending on the approach you take, the Terminals and the Application Server must be able to access the Connection host over the Internet, or the Terminals must be able to connect with a Cloud Server over the Internet.

Each Terminal (and computer/router/etc.) is identified on your LAN and on the Internet LAN by a MAC (Media Access Control) address. This like a serial number and every single device attached to the Internet and every existing LAN installation has a unique MAC address number. This looks something like "`12-34-56-78-9A-BC`". Terminals communicating the an Application Server through a Connection Host are tracked by their MAC address.

Devices on a LAN (and on the Internet) are also identified by an IP address. This looks something like "192.168.1.22". Most network installations use a DHCP server, which is simply a program running someplace on your LAN that manages IP addresses and issues them as appropriate to devices (like computers and Terminals) on your LAN that are configured to use a DHCP server.

Many small networks have a DHCP server running in the wireless access point or DSL modem. DHCP server software usually comes with (and is pre-installed on) your wireless router or DSL modem. Check the documentation for your network devices for details.

It is important that the Connection Host be running on a computer that is assigned a "static" IP address or a URL that is managed through standard or dynamic DNS, or something similar.

The IP address of a particular terminal can also be obtained. Once an 7802 RF Terminal is signed in, it receives messages from the (user created) Application Server via the Connection Host. The terminal responds back to the Application Server program with data that was keyed or scanned by the terminal's user. The host application program processes the data and sends back the next prompt. Each 7802 RF Terminal has a unique hardware ID code (MAC address). The host program can obtain any terminal's MAC address or, for the sake of compatibility with programs written for 70/700 series terminals, resolve terminal addresses to a single character Terminal ID (0-9,A-Z, a-z, and -=) by using the WD7802Term ActiveX component.

The dialog between 7802 RF Terminal and Application Host is established when a terminal connects to the 802.11 RF network. The host computer application waits until a terminal SIGNS ON, then begins its processing by sending the first prompt out to the terminal via an Internet connection.

Logical

The easiest way to think of the logical architecture of the 7802 Terminal system is as a "spoked wheel" or a "star".

Connection Host with Local Application Server Model

Think of the center of the star as the Connection Host which serves to link all of the other pieces of your system together. You may have several Application Servers and hundreds of Terminals all linked together by a single Connection Host.

In fact, this is how the default Worth Data Connection Host works. It provides connectivity to many different Application Servers and their associated Terminals while keeping everything organized and properly connected.

For the 7802 Terminal system, all messages are initiated by the Terminal. The first signal is always a "Sign-In" request sent to the Connection Host. The Connection Host queues the Terminals message and waits for the Application Server to poll and ask if there are any messages waiting. The Connection Host replies to the Application Server's poll by forwarding the Terminal's Sign-In request and waits for the Application Server's reply which is forward to the calling Terminal when it is received. All of this happens in a fraction of a second. The Terminal then closes its connection to the Connection Host, displays the prompt it just received, and waits for the operator to collect some data. When the Terminal sends data to the Connection Host, the cycle is repeated.

Web Based "Cloud" Application Server Model ***(no Connection Host)***

Think of the center of the star as the Web Application ("Cloud") Server installed on your web site. All Terminals link to your Web Application Server. You may have several Web Application Servers (just like having multiple web sites) connecting hundreds of Terminals all running of one web host and central database. You could also have one Web App Server controlling multiple sets of Terminals that sign in with different identification key (username/password/serverID) combinations that control what that Terminal is used for.

This is how the default Worth Data Web Application Server works. It provides connectivity to many different users and their associated Terminals while controlling data access through the identification key (username/password/serverID) combinations.

For the 7802 Terminal system, all messages are initiated by the Terminal. The first signal is always a "Sign-In" request sent to the "Cloud" Application Server. The Application Server responds with prompts and data collection control instructions for the Terminal and then waits for data from the Terminal. All of this happens in a fraction of a second. The Terminal then closes its connection to the Application Server, displays the prompt it just received, and waits for the operator to collect some data. When the Terminal sends data to the Application Server, the cycle is repeated.

Communication

The 7802 RF Terminal has two modes of communication:

- **Sign-In Mode** – the Terminal associates with an 802.11 access point and connects with your LAN. It then attempts to link with a Connection Host or Web Application Server over the Internet and register with an Application Server with matching username, password, and server ID. Upon receiving a "Sign-In" signal from a Terminal, an Application Server will respond with either a prompt command or by sending a batch mode program.

- **Site Survey Mode –** the Terminal scans the local RF environments and displays a report on what it finds.

Here is a discussion of the basic theory behind a **Two-Way** RF Terminal system in a little more depth...

This RF system's dialogue is Terminal initiated. The Terminal says, "**I'm here, give me something to do**. When you select

SIGN ON

the RF Terminal first establishes communication with the network as follows:

1. It looks for an *Access Point.* If an SSID and/or security key (WEP/WPA) is set in the Terminal, the Access Point must have matching settings. During this process, the terminal displays:

   Initializing Radio Unit Please Wait...

2. If the terminal is configured to obtain its IP address from a DHCP Server, it sends a request to the DHCP server and displays:

   DHCP Started Please Wait...

3. The terminal requires an IP address or URL (web site address) setting for the Connection Host (see Wi-Fi Setup). If a Connection Host and/or properly configured Application Server are not found, the terminal will display:

   Host Application Not Found

4. If a connection Host and/or Application Server are found, the RF Terminal sends a SIGN ON message to the Application Server.

When the Application Server (the WD7802term ActiveX control) receives a **SIGN ON** message from a Terminal, the SIGN ON information is transferred to your application program through the *OnTermSignIn* event handler. The host application can then do one of three things:

1. If it has something for the Terminal to do, it can send a prompt to the Terminal through a WD7802term ActiveX control *Input* command. The RF Terminal receives the prompt, waits for the operator to enter the requested data, and then transmits the data back to the application program.

2. The Application Server can send a batch mode program to the Terminal so that data collection can proceed without Internet connectivity.

3. If the host program does nothing within 2 seconds, the Terminal displays the message:

Host Application Not Found
Enter: Retry or F1:Exit

Lets suppose that a Terminal and a host application program have been processing data by sending prompts and data back and forth as described above. The host application program sends a data prompt to the Terminal. The Terminal transmits the operator-entered data back to the Server. If the host application program has another prompt for the terminal, it sends it out, repeating the process above. If the host application program doesn't respond within 2 seconds, the Terminal Device displays

Host Application Not Found
Enter: Retry or F1:Exit

You might walk closer to an Access Point or you might simply hold the terminal up high over your head. When you have repositioned the terminal, pressing the Enter key on the Terminal starts the transmission process over again.

How Site Survey works

The Wi-Fi RF Terminal uses **Site Survey** mode to: 1) test the radios at short range, (50 ft.) as an acid test for correct operation, and 2) to evaluate a specific site for effective coverage. Because each operating environment is different, it is almost impossible to predict the performance without **Site Survey.**

Before you permanently install any hardware, you should perform a Site Survey to fully evaluate your planned area of operation. Selecting option 3 from the main menu will start a Site Survey. The Wi-Fi RF Terminal will listen for APs that are broadcasting SSIDs and display them along with the security type. This information is useful to determine if an area has Wi-Fi coverage or not. It is a good idea to scan a few times at each location since not all SSIDs may be heard by the radio on every scan.

This information will help you later when you are setting up the SSID and security type in the Setup screens of the Wi-Fi RF Terminal.

Performance Issues

Evaluating your area of planned operation

Since every operational environment is different, it is impossible for us to tell you exactly what equipment you need and where you should put it to achieve maximum performance from your RF System. However, since access points are very inexpensive, you should be able to obtain whatever coverage you need. In a typical warehouse, a terminal should be able to achieve communication within about 150 feet of an access point. If you are planning the wiring of a new installation, you will want to lay out your access points so that there is overlap.

There is also some basic information about Radio Frequency itself that can help you make smart choices about the location and composition of your system:

- **Metal walls are almost impenetrable by RF**. If your access point is located in a metal shed, Terminals will likely not operate very well outside.

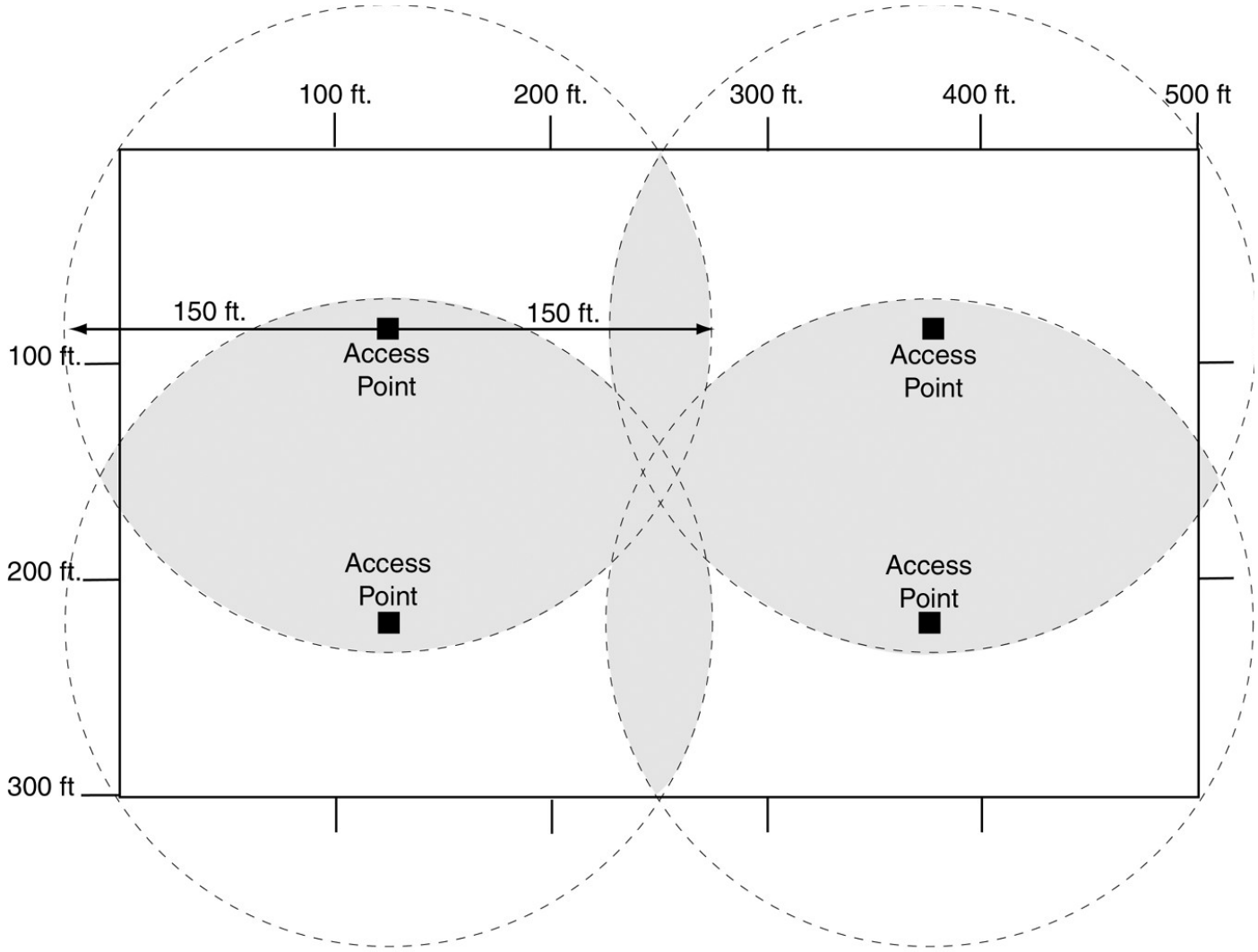
- **The more walls you try to transmit through, the more the signal breaks down.** Walls that have metal studs (interior office walls) and concrete walls with steel rebar slightly degrade the signal with each wall you try to go through. Metal walls may require the use of WiFI repeaters and/or high-gain antenna on your access point(s) to achieve adequate coverage.

- **Organic material absorbs RF energy**. If you are trying to operate in an area with lots of densely packed organic material (bags of beans or corn), expect and plan for reduced operating ranges.

There are some additional measures (other than a Site Survey) you can take early on to maximize your range:

- **APs should be located at the center of the area of intended coverage**.
- **Raise the AP**. Sometimes just raising the AP a foot or two will dramatically increase your operating range, especially in a warehouse or grocery store environment. Mounting the AP on the ceiling with the antenna pointing down is the best.

Below is a diagram showing a 300 ft. by 500 ft. warehouse area with access points positioned to provide planned coverage over the entire area. You do a site test by positioning one access point in each location and verifying that the projected area of coverage is actually attained. (You don't have to be connected to the network to do this site test; you only need to supply power to the Access Point).



If you have difficulty somewhere in the area, as long as that area is in an area of overlapped coverage that a different position of the Access Point covers, you won't have a problem. If you find a spot that none of the planned Access Point locations will cover, you will have to move one of the Access Points closer to the problem spot or plan on adding another closer Access Point. It is best to locate the Access Point in the center as high as possible of the area you intend coverage. The weakest signal will be directly under an access point, (if the antenna is vertical).

Avoid locating antennas close to large metal objects such as filing cabinets, microwave ovens, 2.4GHz cordless phones, or large containers of water. Avoid placing antennas close to an outside wall to minimize signal efficiency. If you need to have coverage outside, place it next to a window. Once you have determined the Access Points and their locations, you are ready to wire the Access Points to the LAN.

To perform a Site Test, turn the unit on and get to the "Mode Menu" which displays as follows:

1. SIGN ON
2. SETUP
3. SITE SURVEY

Press the **3** key to start the Site Survey.

The terminal will do an Access Point Scan and report on the three Access Points with the strongest signals contacted, (or fewer than three is less contacted). You can update the display by pressing ENTER to rescan. The display will have the following format:

WorthData1 WPAv1
WorthData2 WEP
WORTHDATA5 WEP

ENTER:Rescan or F1: Exit

If no Access Point can be located, nothing will be displayed except the bottom line.

The left column is the SSID of the detected access point and the right column is the security method enabled on that access point.

Remember when doing a site test in a warehouse, as the contents of the warehouse change the interference changes too. So if you have a marginal signal on the Site Survey, it may turn into poor performance later.

Chapter 4: Before You Begin Programming…

Overview

In this chapter we are going to talk about planning application design and the various implementation choices available to you. We will look at the various testing configurations offered by Worth Data as illustrations of implementation options.

We will talk about the various parts of the system, their variations and how they can be put together and customized.

Then we will review how to install and configure, depending on your implementation choice.

Finally, we will present a number of tutorials.

Plan Your Application

Consider how you are going to approach your project; there a number of different ways you can go:

1. Write a Windows Application Server program to run locally on your LAN, using the ActiveX control, that will communicate with your Terminals via a Connection Host installed on a web server.

2. As above except use a local Connection Host (this is a Windows program provided by Worth Data) running on your LAN with no Internet access required.

3. Write a non-Windows Application Server program as above except no ActiveX. Challenging but doable.

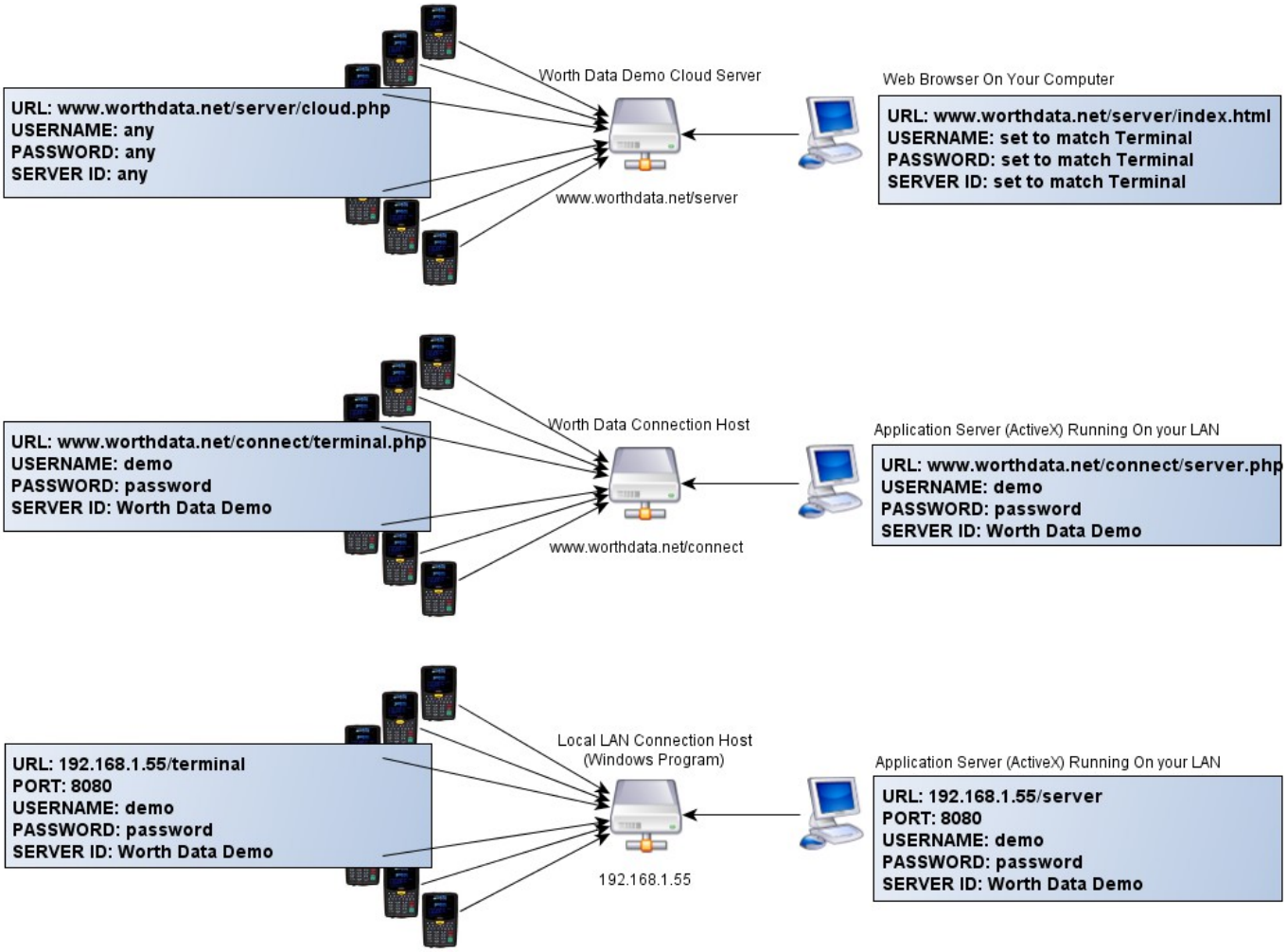
4. Write a web-based "Cloud" Application Server that runs completely on your web server with no Connection Host required.

Worth Data provides demos with full source code for options #1, #2 and #4. If you choose option #3, we provide the HTTP packet definitions and the low-level Terminal script commands elsewhere in this manual.

The demonstration servers are also used as test servers to test your installation and function of your Terminals in the event any trouble-shooting is needed.

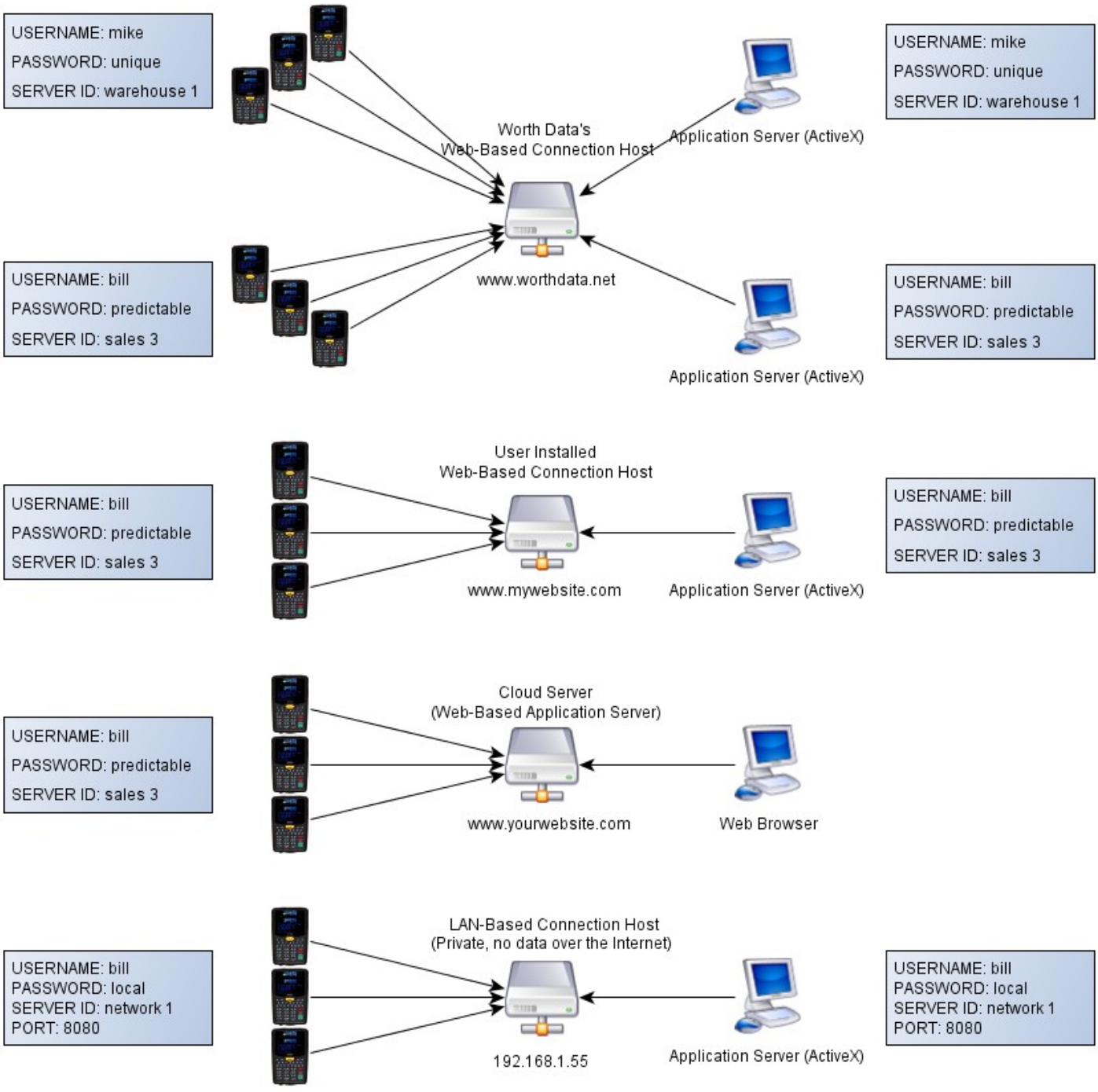
There are two Test Server configurations hosted by Worth Data at www.worthdata.net. One uses the Connection Host model and the other uses the Cloud Server model. There is also the Test Server included in the Integrated Utilities software that uses the local LAN-based Connection Host:

Demo/Test Servers



When you build your application, you will take one of these approaches. Depending on which approach you take, here is a diagram of how the parts of your system will fit together.

Operational Configuration Options



Notice that you can choose to use the Connection Host that Worth Data provides, or install your own. We recommend installing your own when you are ready to put your application into production. For testing and development, feel free to use Worth Data's, but be aware it is a shared resource and may not be available at all times.

Failure Planning

- **Plan for system failures**. This includes hardware failures, software failures and operator failures. In order to create an efficient application, you must put some thought into what you will do when different parts of the system fail.

- **Look for All Errors**. Be sure your program is monitoring all possible error conditions that the Connection Host may return to you. Error conditions are detailed in the next chapter. Don't forget to program for them; this is a common mistake. Failure to trap them can create unpredictable results and be difficult to debug.

- **Use the Test Program**. Each Terminal come setup to use the default web-based test program. This is hosted by Worth Data. The test program allows you to see how the system functions and whether you can anticipate any system-wide problems. The test program can also be used as a response-time benchmark.

Hardware Failures

Let's assume that each part of the system has failed. How are you going to know what has happened and how are you going to recover?

- The most frequent failures are at the Terminal level. If a Terminal has a hardware failure, it will not be able to SIGN OUT. It is possible for the Terminal operator to press the ON/OFF key or the F1 key by accident, forcing the Terminal to SIGN OUT - sometimes in the middle of a transaction. This happens at battery-charging time also. You need to plan for partial transactions - do you trash the data you do have and start over, or pick up where you left off?

- Keep in mind that if a Terminal has SIGNED OUT in mid-transaction, the Connection Host clears any pending message for that Terminal before it will allow it to SIGN ON again. Make allowances to re-send messages or prompts that were cleared upon SIGN ON if necessary.

- If the Application Server or Connection Host has a hardware failure, the Terminal will not be able to communicate with it. If the Application Server crashes and then comes back on-line, all terminals must sign in. If the Connection Host becomes unavailable and comes back on-line, generally all terminals can continue operating without re-signing-in.

Operator Errors

- Plan on your operator walking out of range and going to lunch in the middle of a transaction. What do you do with the data you do have, and where are you going to start up again?

- Let's say your operator is SIGNED ON and decides it's time to take a break. Instead of pressing the F1 key to SIGN OUT, he presses the OFF key. Pressing the OFF key is OK (it will SIGN him OUT) but there is a delay until the SIGN OUT is acknowledged. Because of the delay, the operator might think he didn't press the key hard enough and press it again - this time actually powering down the Terminal *before* the SIGN OUT was complete. If this happens, you need to plan to *re-send* the last prompt to the Terminal when he SIGNs ON again.

Parts of the System

Provided by Worth Data and specific to the 7802 WiFi RF Terminal:

1. Terminal(s)

   "**Terminal(s)**" refers to one or more Worth Data WiFi RF7802 Terminals.

2. Connection Host

   "**Connection Host**" is software that provides a link or "relay" between your Terminal(s) and the Application Server. The Connection Host comes in two versions, one is for installation on an internet website hosting service, and one that is a Windows program that can be run on a computer in your local network (no internet required).

   Keep in mind that it is possible to not need a Connection Host for a fully working system. You can install you own custom "Cloud Server" (see the diagrams above). See the source code for the Worth Data Cloud demo for more information.

3. Application Server

   The "**Application Server**" or "Server Program" is a program designed and written by the user that incorporates the WD7802Term ActiveX control. When an 7802 RF Terminal is turned on and sends a "sign in" message to the Connection Host, this message is relayed to an Application Server that is configured with the same Server ID, Username, and Password as the Terminal (see Terminal Setup) .

   When a Terminal SignsOn, the WD7802Term control reports a terminal ID number to the host application (the Application Server) that is unique to that terminal.

   There can be multiple Application Servers associated with a single Connection Host, each configured with unique Server ID/Username/Password to match the Terminal(s) intended to communicate with that particular Application Server.

   An Application Server can also be "Cloud" Server that does not require a Connection Host; Terminals communicate directly with the Cloud Server. You can program your custom Cloud Server to use the Terminal's "Server ID/Username/Password" settings for anything you want. A Cloud Server is a pure Web-based application and does NOT use the WD7802Term ActiveX control. For more information, review the provided demo source code.

User Provided:

1. Fixed or mobile ("MiFi") Access Point (AP, required)

   An "access point" is a device that you attach to your LAN that allows wireless network devices (like your laptop computer) to attach to your LAN as if you were plugging it in via an ethernet cable.

   A "wireless router" is an access point that includes some sort of router (like a DSL or cable modem) in the same box. A wireless router usually has 5 or more connector sockets while a simple access point usually

has just one connector socket.

This sort of access point can be purchased from a typical computer retailer. Look for brands like *Cisco, Netgear, Linksys,* etc.

An access point can also be a portable cellular device that allows wireless devices (like your laptop computer) to connect directly to the Internet. Many newer model "smart" cell phones now come with built-in access points. You can also get dedicated mobile access point devices from Verizon (MiFi) and Sprint, and other.s.

Keep in mind that a mobile access point is different from a computer "tethering" or USB mobile internet adapter.

The Worth Data 7802 WiFi RF Terminal requires an access point to connect to.

2. Local Area Network (LAN) or Cellular Mobile AP (required)

Operation of the 7802 Terminal requires at least a local LAN with an access point OR a mobile cellular access point.

The local LAN is required so that there is a computer to run a Connection Host/Application Server that the Terminal can connect with via the LAN. The LAN can also provide Internet connectivity which the Terminal can use if desired.

Alternatively, using a mobile access point, the Terminal has direct access to the Internet where a Connection Host or Application Server can be running.

3. Internet connection from LAN (optional)

A Connection Host/Application Server can be installed entirely on a LAN with no Internet connection required. Or a Connection Host/Application Server can be installed on a an Internet web hosting service and access via your LAN Internet gateway.

The advantage to using a Connection Host/Application Server running on the Internet is that you can access it from anywhere in the world if you have Internet connection via an access point.

4. Web Host (optional)

A web hosting service is required to run a Connection Host on the internet. Most web hosting services, like HostGator and GoDaddy, support the necessary features for the Connection Host.

Also, if you want to design your own web-based Application Server (a "Cloud Server") and not have to use a Connection Host, you will need to install this on a web hosting service account.

However, we do provide a Windows version of the Connection Host, so you can install a complete system on your LAN with no Internet required.

5. Computer on LAN to run Application Server (optional)

As mentioned above, there are two possible ways to implement an Application Server: One is using the RFTerm Active Control to create a Windows-based Application Server that connects with Terminals via a Connection Host (running on the Internet or on your LAN), and the other is build a custom Internet based Application Server ("Cloud Server") that does not need a Connection Host and requires no computer on your LAN to run (it runs entirely on a web hosting service server).

Install The Web-Based Connection Host

Overview

The Connection Host is installed on a Web Server, usually provided by a web hosting provider. It is NOT installed on your desktop Windows computer (unless you have the expertise to have a web server running on it as well!)

Keep in mind that one Connection Host can be used for numerous Local Application Servers. The "username/password/serverID" keycodes allow the Terminals to be matched to different Local Application Servers, all using the same Connection Host.

Worth Data provides a Connection Host already installed on our web site that you can use. While you *can* use it for production, it is intended for testing and demonstration. It is provided "as-is" and while the user/server ID/password system provides some data security, we cannot guarantee it. We strongly recommend you install your own Connection Host on your own web host.

Details

When you install the Hardware Utilities, the necessary files are located in

```
My Documents\Worth Data\Hardware\Connection Host Source
```

They are

```
install.php
terminal.php
server.php
varstermrouter.inc
```

The first step in installing a Connection Host is to **prepare your web site host**. You will need to have a database set up to hold the necessary data tables used by the Connection Host. A typical web hosting service provider will use a tool called "cPanel" as your control system for your web site. This includes tools like "MySQL Databases" and "phpMyAdmin".

Use these to create a new empty database (if you need a new one). You can also use an existing database and the new required tables will be automatically added by the install.php. You will need to know a username and password for accessing your database; the cPanel tools (or equivalent) from your web hosting provider will give you access to this.

Set the necessary database access parameters in `varstermrouter.inc`. Enter the appropriate database name, user name, and password. Open this file in your text editor and set the variables as required by your web host server. If you are editing a local copy of this file, make sure to upload your changes to your web server.

Then, **copy the necessary files (listed above) to your web site**. Typically you will use an FTP client such as Filezilla or whatever is provided by your web hosting service to copy the files out to your web server.

When you copy these out to your web server, you should put them in a subfolder to keep them separate from the rest of the content of your web site.

Run the `install.php` script by opening your web browser and going to

```
www.mywebsite.com/afolder/install.php
```

If you see any error messages, the most likely cause is incorrect settings in `varstermrouter.inc`. Use your text editor to view the contents of `install.php` for further details.

Full source code of the Connection Host is provided, so you can modify it as you desire. Here is a summary of the function of each file:

- ***terminal.php*** is the Terminal interface to the Connection Host. That is, this is the web page that the Terminal uses to communicate with. You can browse it with a regular web browser, but you won't see much because the Terminal creates very specific URL commands that *terminal.php* uses.
- ***server.php*** is the Application Server interface to the Connection Host.
- ***varstermrouter.inc*** includes the password and username for the system to access your web server's database back-end. Unless you modify the code to work with a different database, this must be MySQL version 5 or later.

Install Local Connection Host and Test Server

Your Terminal comes preset to access Worth Data's web-based Cloud Server which provides a very simple testing and setup system for your Terminal. All you have to do is configure your Terminal to connect to your LAN's wireless access point and internet gateway.

If you prefer, you can instead use the Local Connection Host and Test Server that is included with the Integrated Utilities program.

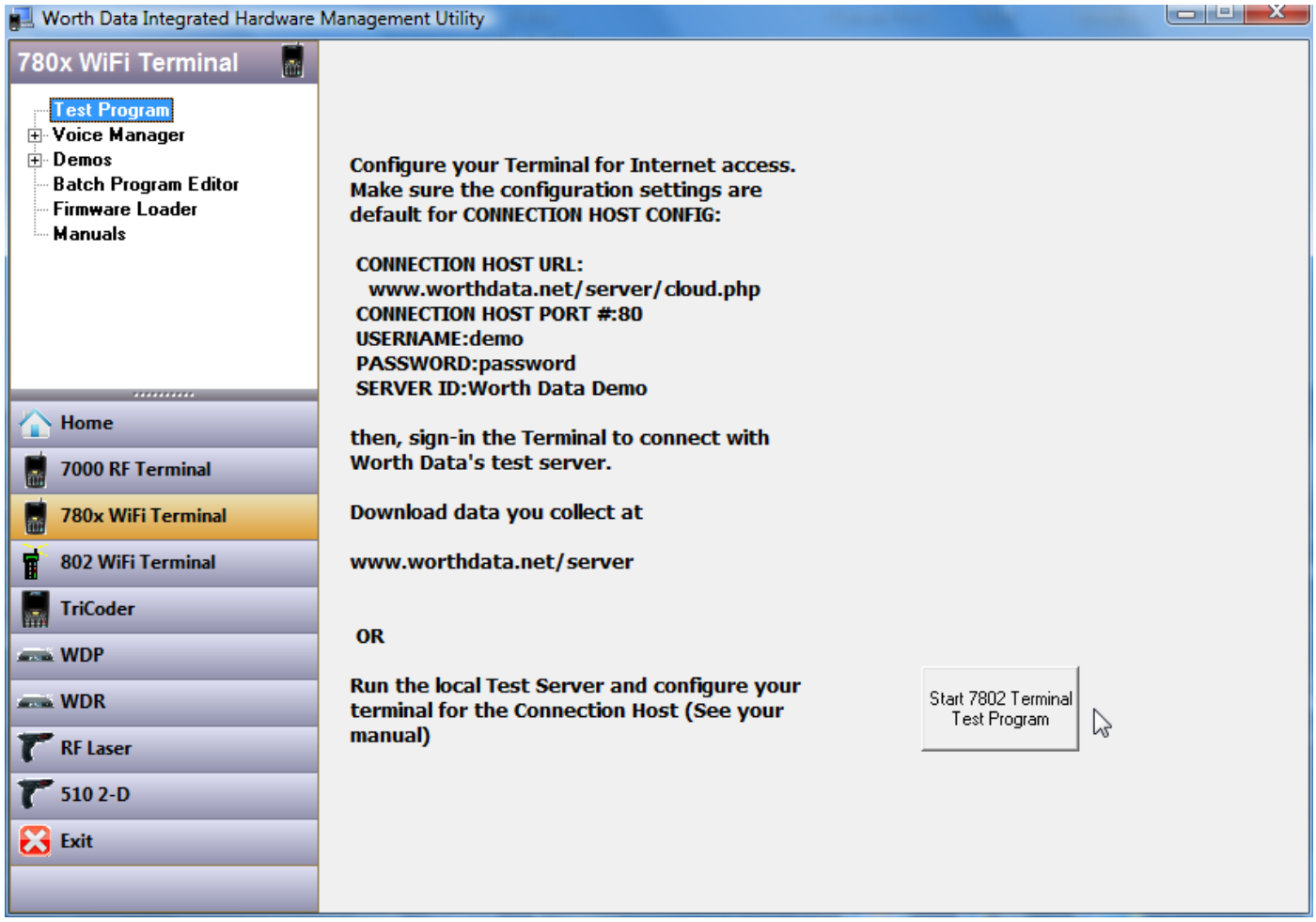
When you install the Integrated Utilities on your computer (on your CD or download from www.barcodehq.com), the Local Connection Host program and the Test Application Server are installed on your computer along with the ActiveX programming tool for creating your own Application Server.

Click on your Windows Start button and find the Hardware Utilities Program in

```
Programs/Worth Data Hardware/Hardware Utilities
```

Select the “780x WiFi Terminal” from the menu on the left:

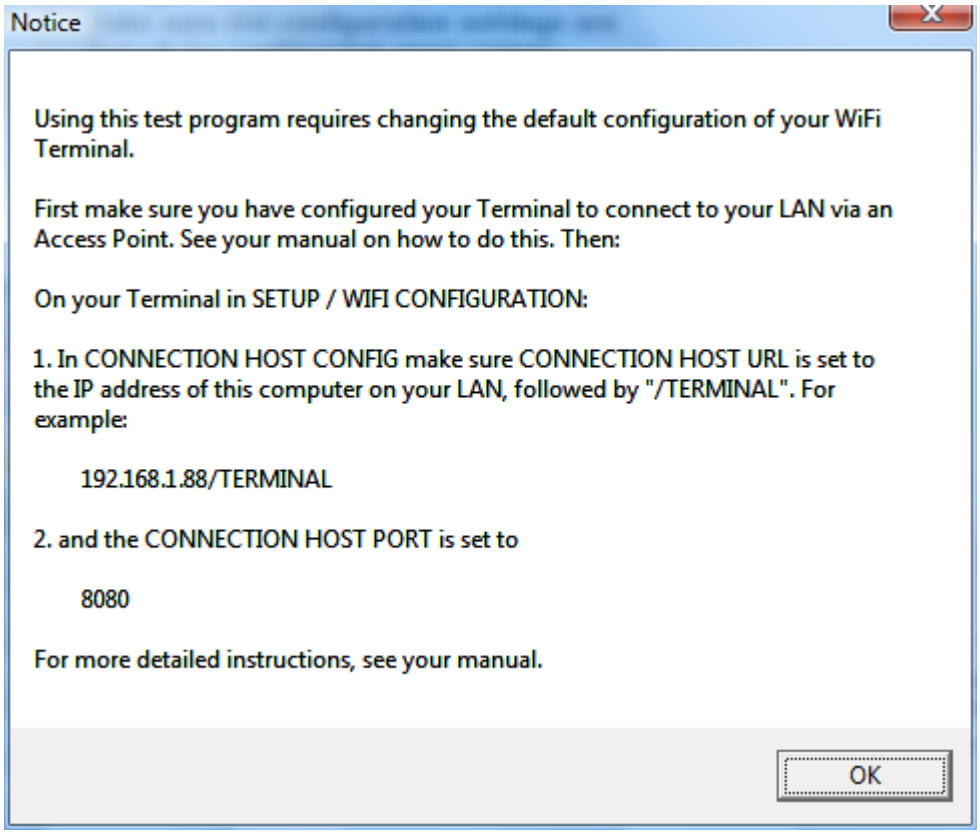
Select “Test Program” at the upper-left:



Then click on the button for “Start 7802 Terminal Test Program”

How To Use Local Test Server

When you start the Test Server, you will first see a notice about how you must configure your Terminal(s) in order to work with the Local Test Server.


Notice
Using this test program requires changing the default configuration of your WiFi Terminal.
First make sure you have configured your Terminal to connect to your LAN via an Access Point. See your manual on how to do this. Then:
On your Terminal in SETUP / WIFI CONFIGURATION:
1. In CONNECTION HOST CONFIG make sure CONNECTION HOST URL is set to the IP address of this computer on your LAN, followed by "/TERMINAL". For example:
192.168.1.88/TERMINAL
2. and the CONNECTION HOST PORT is set to
8080
For more detailed instructions, see your manual.
OK

Notice that your Terminal must be set to find the Local Test Server on your LAN. This requires finding the IP address of your computer on your LAN.

Do this by opening a DOS (Command) window and entering the command:

```
IPCONFIG
```

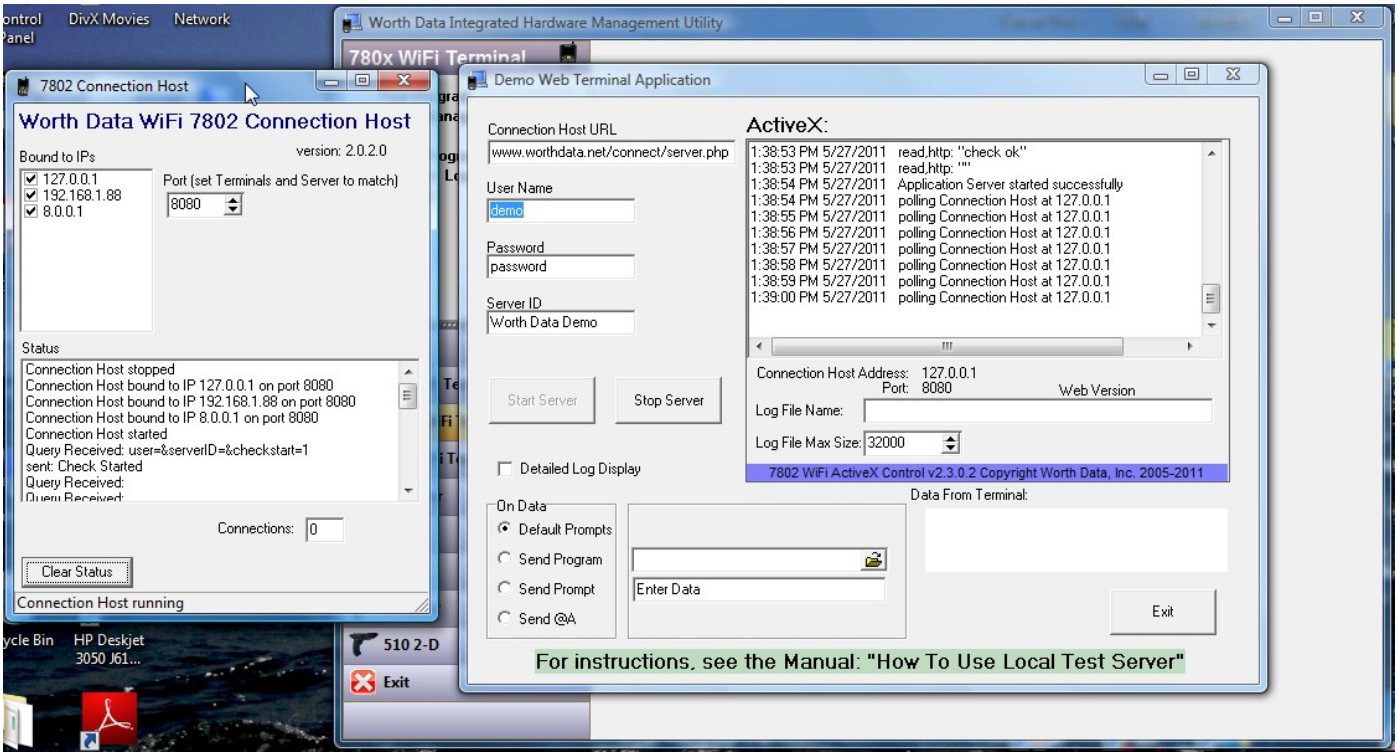
You will see a list of connection information for your computer. Find the one marked “Local Area Connection” or “Wireless LAN Connection” or similar that gives you information on:

```
IPv4 Address.......: xx.xx.xx.xx
Subnet Mask........: xx.xx.xx.xx
Default Gateway....: xx.xx.xx.xx
```

The “Ipv4 Address” is what you need for configuring your Terminal to connect with the Local Connection Host running on your computer.

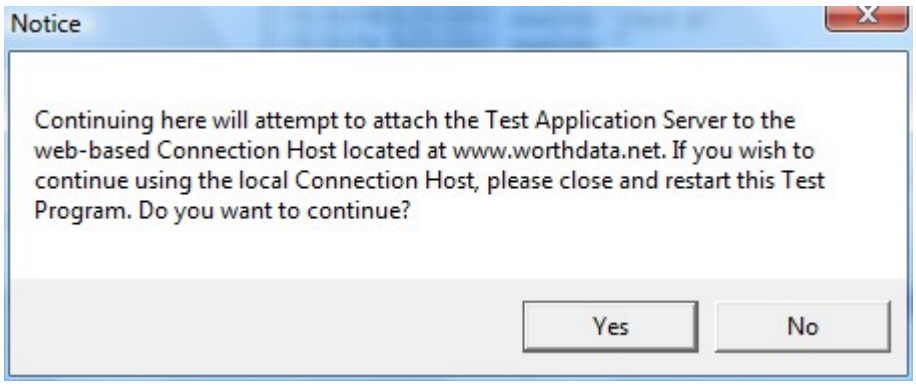
Also, if you are intending to use a Local Connection Host running on a computer on your LAN, you will want that computer to have a static IP address and not use a DHCP server. If you are not familiar with static IP address and DHCP servers, consult your network administrator for more help.

Once you click OK on the notice, the local LAN-based Connection Host program automatically start and then the actual Test Server will load.



When the Test Server and Local Connection Host start, they are automatically running and pre-configured. All you have to do is configure your Terminal to communicate with the Local Connection Host (as outlined above).

If you click on the “Stop Server” button in the Test Server window, the Local Connection Host will shut down and the Test Server will set itself to connect with Worth Data's web-based Connection Host, rather than the Local Connection Host. When you then click on “Start Server” button (once it becomes enabled), you will see a notice informing you of this.


Notice
Continuing here will attempt to attach the Test Application Server to the web-based Connection Host located at www.worthdata.net. If you wish to continue using the local Connection Host, please close and restart this Test Program. Do you want to continue?
Yes
No

When you start the Test Server, you will see that it has a number of setup options that can be useful if you want to test , for example, your own web-based Connection Host installation:

Connection Host URL
User Name
Password
Server ID

as well as some options for “On Data” and “Log Display”.

Server Setup: Connection Host URL
The default setting here is the internet address for the Connection Host that Worth Data provides. You can leave it as is, or if you want to use your own Connection Host, set it to the URL of wherever you installed yours.

This can be a URL like "www.mywebsite.com/afolder/server.php or it can be an IP address like http://12.48.196.34/server.php

Don't forget the "server.php" (all in lower case).

Server Setup: User Name, Password, Server ID
These are the "key codes" that the Connection Host uses to match up Terminals with the correct Application Server. They must be set exactly the same in your Terminal and on the Test Server.

You must choose something besides "demo" for the User Name; "demo" is reserved for Worth Data's Test Server. If you leave all these settings at default, you will get an error (displayed on the ActiveX log).

Server Setup: Detailed Log Display
This option simply toggles the ActiveX log between simple and verbose display modes.

Server Setup: On Data
This is a set of options that allow you see how some of the Terminal's features work. For example. If you have use the Batch Program Editor to create a Batch Program File, you can instruct the Server to send the Batch Program (enter the file name in the box to the right of "Send Program") instead of a prompt when a Terminal signs-in or sends data.

There is also an option to send a custom prompt (enter it in the box to the right of "Send Prompt") or to send a "@A" which is how you respond to receiving Batch data to tell the Terminal to continue running its Batch program.

Terminal Setup: Connection Host URL
Your Terminal is shipped to you with default settings that will allow it to connect to the Test Server running on Worth Data's web site. This is actually a simple "Cloud Server". If you want your Terminal to use a Connection Host instead, you must change the Connection Host URL

Follow the menu on your Terminal screen:

```
SETUP
WIFI CONFIGURATION
CONNECTION HOST CONFIG
```

Enter the same URL as you did in *Server Setup* above except **change *server.php* to *terminal.php***.

Terminal Setup: User Name, Password, Server ID
Follow the menu on your Terminal screen:

```
SETUP
WIFI CONFIGURATION
CONNECTION HOST CONFIG
```

Enter exactly the same settings here as your did above for the Server.

Start the System
Run your local Test Server. Make sure the settings are correct and click on the "Start" button.

The Test Server then attempts to evaluate its link with the Connection Host, and you will see a count-down displayed on the log.

> Initializing Server in 5 Seconds...

If there is a problem, you will see an error message. Once the Server connects with the Connection Host, you will see.

> Application Server started successfully

Once you have successfully started your Application Server, now it is time to sign-on a Terminal.

Install Cloud Server

Overview
A "Cloud Server" is a web-based Application Server installed on a standard web server. It is a program that resides on the internet (in the "Cloud") and controls the data collection Terminals and interacts with you through a web browser or some custom software that you design that communicates with the Cloud Server via the internet.

A Cloud Server does not require a Connection Host. Your Terminals communicate directly with the web-based Application Server.

A Cloud Server can be installed on almost any web server. It can be put on a typical hosted web site account (like you might find with GoDaddy or HostMonster) or it can be installed on a web server (typically an Apache installation) that is part of your LAN.

Worth Data provides a sample Cloud Server that you can use as a starting point for developing your own.

Of course, installing and working with this software requires some basic knowledge of server-side scripting (PHP in particular) and general knowledge of how the parts of such a system fit together.

Details
The first step in installing a the demo Cloud Server is to **prepare your web site host**. You will need to have a database set up to hold the necessary data tables used by the Cloud Server. A typical web hosting service provider will use a tool called "cPanel" as your control system for your web site. This includes tools like "MySQL Databases" and "phpMyAdmin."

Use these to create a new empty database (if you need a new one). You can also use an existing database and the new required tables will be automatically added by the install.php. You will need to know a username and password for accessing your database (the cPanel tools will give you access to this).

Set the necessary database access parameters in `varstermrouter.inc`. Enter the appropriate database name, user name, and password. Open this file in your text editor and set the variables as required by your

web server. If you are editing a local copy of this file, make sure to upload your changes to your web server.

Then **copy the necessary files to your web site**. Typically you will use an FTP client such as Filezilla or whatever is provided by your web hosting service to copy the files out to your web server.

When you install the WD7800 Programming Tools, the necessary files are locating in

```
My Documents\Worth Data\Hardware\Cloud Server Demo Source
```

They are

```
install.php
cloud.php
index.html
varstermrouter.inc
```

When you copy these out to your web server, you should put them in a subfolder to keep them separate from the rest of the content of your web site.

Run the `install.php` script by opening your web browser and going to

```
www.mywebsite.com/cloudfolder/install.php
```

If you see any error messages, the most likely cause is incorrect settings in `varstermrouter.inc`. Use your text editor to view the contents of `install.php` for further details.

Full source code of the Cloud Server is provided. You can use it as a starting point for creating your own custom version. Here is a summary of the function of each file:

- ***cloud.php*** is the Terminal interface to the Cloud Application. That is, this is the web page that the Terminal uses to communicate with. You can browse it with a regular web browser, but you won't see much because the Terminal creates very specific URL commands that *cloud.php* uses.
- ***index.html*** is the user interface to the Cloud Application. It is accessed as a regular web page.
- ***varstermrouter.inc*** includes the password and username for the system to access your web servers database back-end. Unless you modify the code to work with a different database, this must be MySQL version 5 or later.

How To Use The Cloud Server

First, some more detail about the Cloud Server. Mentioned above are the files that make up the system, but the real core of the process is in how the cloud.php script uses the tables associated with the Cloud Server.

Tables

```
proj_program
proj_terminals
proj_data
```

proj_program stores the list of low-level Terminal commands that define how the Terminals behave. Another way to think of this table is as the “Terminal program definition”. The key features of this table is each record contains an order code (“program pointer” for program sequence), where to “jump” in the event of a “yes” or “no” terminal response, and the actual program script to send to the Terminal for this prompt.

proj_terminals keeps track of what step in the program definition each Terminal is at (Think of it as the "program pointer" for each Terminal.

proj_data stores the data collected from each Terminal. By indexing on Terminal ID (MAC address) and a SQL auto-inc field, we can insure that "Quantity B" is for "Item A", even with many Terminals running simultaneously. And, so you can tell which prompt a piece of data is associated with, each record also includes the "program pointer".

Use a tool like phpMyAdmin (widely available from web hosting providers) to view the tables installed.

Notice that *proj_data* includes fields for username/password/serverID. This should look familiar. By using these fields, we can retrieve data selectively from Terminals that use matching "key code" settings.

This is exactly how the user interface web page (index.html) works: It prompts you to enter Username, Password and ServerID data and then only allows you access to data with matching keys in the data table.

On to using the Cloud Server. The Terminal must be set up properly. Once you have set it up to connect with your access point, all you have to do is set the Connection Host Address URL to point to wherever you have put *cloud.php* on your web server.

Terminal Connection Host URL Setting

Follow the menu on your Terminal screen:

```
SETUP
WIFI CONFIGURATION
CONNECTION HOST CONFIG
```

The default setting here is the internet address for the Cloud Server that Worth Data provides for testing your Terminals. You can leave it as is, or if you want to use your own Cloud Server, set it to the URL of wherever you installed yours.

This can be a URL like "www.mywebsite.com/afolder/cloud.php or it can be an IP address like http://12.48.196.34/cloud.php. The exact web address depends on where you installed the Cloud Server.

Don't forget the "cloud.php" at the end of the address (all in lower case).

User Name, Password, Server ID

These are the "key codes" that the Cloud Server uses to match up Terminals with the collected data.

When you want to download the data you have collected, you will use your web browser to go to

www.mywebsite.com/afolder/index.html

You will need to know the values of your "key codes" exactly to enter onto the web page for accessing your data. If you have left them at the default on the Terminal, and use the Cloud Server on Worth Data's web site, anyone else, by using these same default values, can retrieve the data you collect. Remember that the User Name, Password, and Server ID combination is the key to your data.

If you are familiar with basic web site building, you can see that it would be easy to modify the Cloud Server we provide to suit many custom applications, especially if you manage your data in Excel.

Tutorials

Cloud Server

Your terminal comes configured by default to access Worth Data's Test Cloud Server at

www.worthdata.net/server/cloud.php.

Of course, you must first configure your Terminal to connect with an access point on your LAN.

> See the chapter on RF System Setup to configure the Terminal to connect to your access point. The settings that determine what server you use that are pre-configured are in
>
> `SETUP → WIFI CONFIGURATION → CONNECTION HOST CONFIG`

Once you have an internet connection with your Terminal, all you have to so is SIGN ON. When you do, assuming everything is working properly with your Terminal, you will see a prompt

```
Scan Item:
```

Key or scan some data. Press enter and you will see the next prompt

```
Enter Quantity:
```

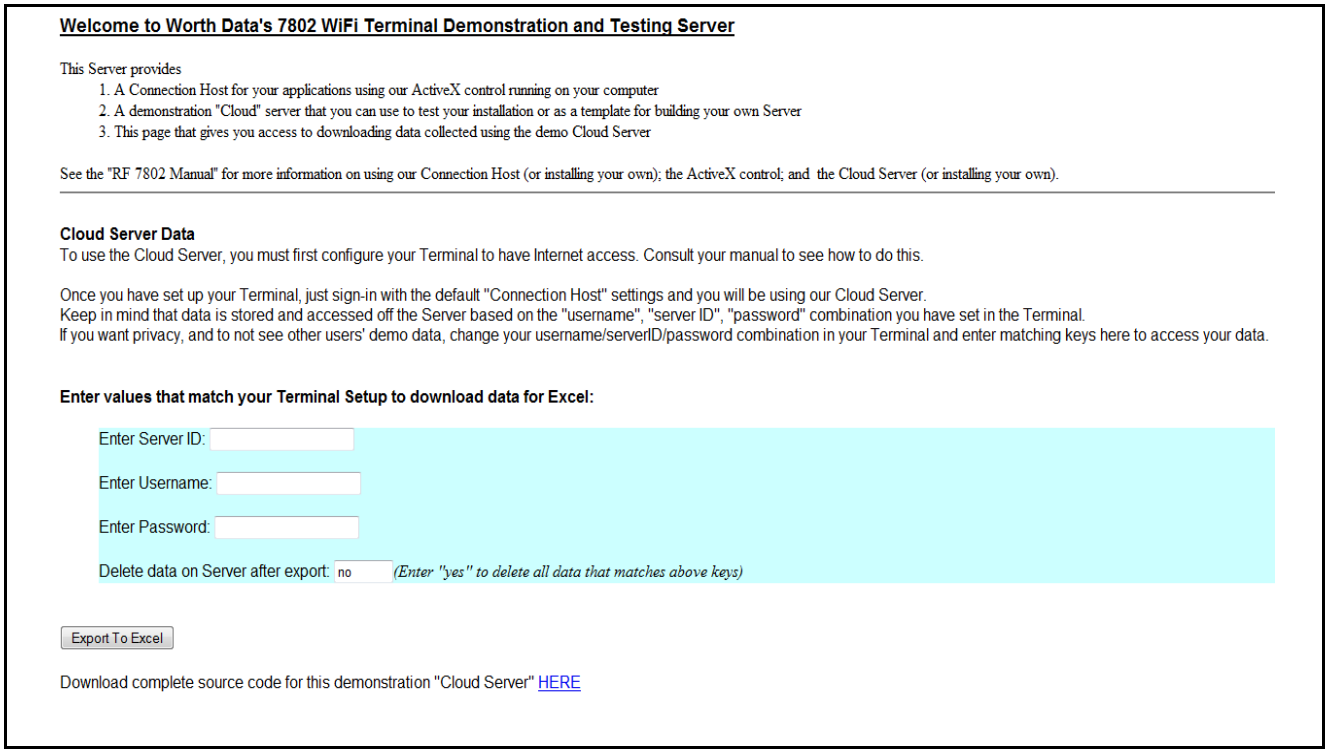
These prompts repeat. Collect as much data as you desire.

Now go to your web browser and point it to

www.worthdata.net/server

Enter the same keys (username, password, serverID) that are set in your Terminal's `CONNECTION HOST CONFIG`. If you have left these settings at default they are

USERNAME: demo
PASSWORD: password
SERVER ID: Worth Data Demo


Welcome to Worth Data's 7802 WiFi Terminal Demonstration and Testing Server
This Server provides
1. A Connection Host for your applications using our ActiveX control running on your computer
2. A demonstration "Cloud" server that you can use to test your installation or as a template for building your own Server
3. This page that gives you access to downloading data collected using the demo Cloud Server
See the "RF 7802 Manual" for more information on using our Connection Host (or installing your own); the ActiveX control; and the Cloud Server (or installing your own).
Cloud Server Data
To use the Cloud Server, you must first configure your Terminal to have Internet access. Consult your manual to see how to do this.
Once you have set up your Terminal, just sign-in with the default "Connection Host" settings and you will be using our Cloud Server.
Keep in mind that data is stored and accessed off the Server based on the "username", "server ID", "password" combination you have set in the Terminal.
If you want privacy, and to not see other users' demo data, change your username/serverID/password combination in your Terminal and enter matching keys here to access your data.
Enter values that match your Terminal Setup to download data for Excel:
Enter Server ID:
Enter Username:
Enter Password:
Delete data on Server after export: no (Enter "yes" to delete all data that matches above keys)
Export To Excel
Download complete source code for this demonstration "Cloud Server" HERE

Click on the “Export To Excel” button to download the data you just collected directly into Excel running on your computer.

Connection Host

Since your terminal comes configured by default to access Worth Data's Test Cloud Server, you must make some changes to the Terminal's WIFI configuration settings. Of course, you must first configure your Terminal to connect with an access point on your LAN.

> See the chapter on RF System Setup to configure the Terminal to connect to your access point.

The settings that determine what server you use that are are in (from your Terminal's main screen):

```
SETUP → WIFI CONFIGURATION → CONNECTION HOST CONFIG
```

To access the Worth Data Connection Host Demo, make sure your Terminal's CONNECTION HOST CONFIG is set as follows:

```
CONNECTION HOST URL: www.worthdata.net/connect/terminal.php
USERNAME: demo
PASSWORD: password
SERVER ID: Worth Data Demo
```

Once you have an internet connection with your Terminal, all you have to so is SIGN ON. When you do, assuming everything is working properly with your Terminal, you will see a prompt.

```
Scan Item:
```

Key or scan some data. Press enter and you will see the next prompt

```
Enter Quantity:
```

These prompts repeat. Collect as much data as you desire. Data you collect is retrieved by the Worth Data server and discarded.

Chapter 5: Programming for the RF Terminal

Two levels of programming support offered for the 7802 WiFi Terminal are:

- **Active X drop-in component**. Every necessary function is defined. You just complete the code for each function. The ActiveX component, along with the Connection Host software, functions as a Server for managing data traffic to and from one or more terminals (your "terminal network") and as an interface for your host application running on your PC. There is no other software required, besides this ActiveX control, the Connection Host software, and your host application to run a terminal network.
- **Direct ASCII** low-level script commands sent to and data sequences received from the Terminal. Necessary for a user program running on a web server (a "Cloud" application) or any Application Server built without the ActiveX control. A complete demo of the "Cloud" application with source code is provided.

- Remember, plan for errors.
- Programming languages that can interface with the ActiveX tool include VB, C++, Delphi, Access, FoxPro, etc.
- Make sure you set your compiler for 32-bit compatibility. The ActiveX control is designed to work with 32-bit (x86) programs.

Operating Mode

There are two basic modes of operating the 7802 RF Terminal:

Real-Time Mode and **Batch Mode.**

"Batch" and "Real-Time" refer to the way data collection prompts are managed by the Terminal.

Real-Time Mode

Real-time mode is just that, where each piece of data collected (scanned or keyed in) requires a response from the Application Server in order to proceed to the next piece of data. The response from the Application Server is the prompt for the next data input at the Terminal.

Terminal-Server communication sequence looks like:

Terminal	Server
1. Sign-in	2. Send 1st prompt
3. Scan data	4. Send 2nd prompt
etc.	

In Real-Time mode, the Terminal operates similarly to a classic “dumb terminal” where the display is controlled completely by the Server.

Obviously, Real-Time mode requires good continuous connectivity with the Server. If the connection with the Server becomes unavailable, the Terminal is unable to continue data collection.

Batch Mode

Batch mode requires that a “Program” is sent to the Terminal by the Server instead of a simple prompt. The Program is a script that defines a series of data collection prompts, and related rules and conditions. See chapter on *Batch Programming* to learn how to create a Batch Program file.

Once a Program is loaded into the Terminal, the Terminal can proceed with data collection without requiring a connection to the Server. All data collected is stored in memory until the Terminal is instructed to try to send it to the Server.

Terminal-Server communication sequence looks like:

Terminal	**Server**
1. Sign-in	2. Send Batch Program
3. Scan data	
4. Scan data	
5. Scan data	
6. Transmit data	7. Acknowledge
8. Continue...	

If a Batch Program has been loaded into the Terminal in a previous session, there is an added option on the Terminal startup display:

1. SIGN ON
2. SETUP
3. SITE SURVEY
4. **BATCH MODE**

This is because the Terminal saves the Batch Program and any un-sent collected data even if the unit is powered down.

In this case, the Terminal-Server communication might look like:

Terminal	**Server**
1. Batch Mode	
3. Scan data	
4. Scan data	
5. Scan data	
6. Transmit data	7. Acknowledge
8. Continue...	

If you are familiar with the Worth Data TriCoder, you already how how a Batch Program works. Keep in

mind that there are some **limitations compared to a TriCoder**:

- Unless your data structure is only one field repeating, you must use data identifiers with each data field so that your Application Server can figure out what to do with each piece of data. In other words, if all you are doing is scanning “Item”, “Item”, “Item”, you do not need identifiers. But, if you are scanning “Item”, “Quantity”, “Item”, “Quantity”, then you must use identifiers so your server can see the difference between “Item” and “Quantity” values.
- Batch Mode Programs do not support tables. This means that while operating in Batch Mode, you cannot do lookups or data validation using a table. Of course, you can easily do both in Real-Time mode by writing these functions into your Application Server.
- There is a new statement code for the Batch Program: “x” This instructs the Terminal to try to send its stored data to the Server. The operator can also enter the key sequence “F1-shift-X” to force a data-send attempt.
- There is no “Data Review Mode” on the Terminal.
- There is no “Programming Mode” on the Terminal. You must create and edit your Batch Program file using the Batch Program Editor in the 7802 WiFi Terminal section of the Integrated Hardware Utilities Program supplied on the CD with your Terminal. This software is also available for free download.

See the chapter on how to build a Batch Program file for more information

Direct ASCII, Non Windows, and Cloud-Based Installations

It is possible to create a host application to control WiFi Terminals without using the ActiveX control, and even without using Windows at all.

One scenario might be that you want a host program running on your PC (maybe it is a Mac or running Linux). You are OK with using an un-modified Connection Host running somewhere out on the Web. In this case, you will need to understand the native command language that the Terminal uses and build a way to send and receive HTTP packets to and from the Connection Host. The structure of these packets is defined (see SERVER.PHP in the Connection Host files). Building this kind of TCP communications into a program is challenging, but a competent programmer should be able to handle it.

Another scenario might be that you want to do away with ActiveX and a client-based server altogether. You want to control your Terminals directly from a Web server host and interface directly with a database backend such as MySQL or MSSQL Server or whatever is your favorite. The way to do this is to modify CLOUD.PHP (with the Connection Host distribution) to suit your application. Or, port the CLOUD.PHP code to whatever is your favorite web programming environment.

Terminal Native Command Reference

HTTP / Low Level ASCII script sequences

Planning

Local, PC-based programs can be written in any language that has some way to access TCP communication on your LAN and over the Internet.

Web based server applications can be written in any language that can access a database backend and serve HTTP web pages, such as PHP, ASP, Pearl, Python,etc.

Host - Terminal Communication Programming

All messages sent to a Terminal are in the form of a simple HTTP web page. All messages received from a Terminal are in the form of a standard HTTP page request.

Data coming from and going to a Terminal is embedded in the data portion of the HTTP structure as defined below.

The Terminal initiates all communication. Connection is kept open until server replies and then closed.

Terminal Output Definition

This is page request sent to web server, either a Connection Host or a web-based Application Server.

Sample:

```
POST /connect/terminal.php HTTP/1.1
Host: www.worthdata.net
Keep-Alive: 115
Connection: keep-alive
Content-Length: 56
Content-Type: application/x-www-form-urlencoded

user=peter&pswd=test&termID=t1&serverID=s1&termdata=%0F
(blank line)
```

Explanation:

This is a standard “page request”, just like what would be sent by your web browser program. It is equivalent to

```
www.myserver.com/termrouter/terminal.php?user=peter&pswd=test&termID=t1&serverID=s1&termdata=%0F
```

The HTTP “header” portion is the first 6 lines; could be more or less, but is always followed by a blank line. The actual data starts with “user=...” and is always followed by a blank line that terminates the HTTP packet.

Most programming environments will have tools to help you break out the variables contained in the data:

user
pswd

termID
serverID
termdata

You can see that the actual data coming from the terminal is “%0F” which is HTML encoding for ASCII #15, which is a “Sign-In” request.

USER, PASSWORD, and SERVERID all come from the Terminal's setup.

TERMID is the MAC address of the Terminal and is unique for every Terminal

Note that non-printable ASCII characters (as well as “&”, “?”, and “;”) must be sent as %hh, where hh is a two char hex value. Also, space characters must be mapped to “+”.

Terminal Receive Definition

Unless you are writing something in assembly language, chances are you will not care about the minutia of the data packaging for the Terminal. All you have to do is generate a text-only web page that contains something like this:

```
wd*data:@1,1,1,Enter Data%04
```

where “wd*data:” is the data header that tells the Terminal this is bonafide, and everything else is part of a low-level script command for the Terminal (as described below).

HTTP Page Definition

If you are curious about the HTTP structure of the web page you send to the Terminal looks like, read on, but keep in mind this is the data you want to send:

wd*data:@1,1,1....

The HTML page you generate would look something like this:

```
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=Cp1252">
<title>My Terminal Sign-in Answer Page</title>
</head>
wd*data:@1,1,1,Enter Data%04
</html>
```

What we describe below is all the wrapper information a typical web server adds in order to properly format a web “page” that includes the data you want to send.

This is what the Terminal receives from the Connection Host/web-based App Server in response to a properly configured page request as outlined above.

Sample:

```
HTTP/1.1 200 OK
Content-Type: text/plain
Transfer-Encoding: chunked

19
wd*data:@1,1,1,Enter Data%04
(blank line)
```

Explanation:
Basically, the terminal will read the first line and make sure it includes “100 Continue” or “200 OK” (more on this below) and then read lines until it finds a blank line (CR/LF alone). If one of the header entries is

```
Transfer-Encoding: chunked
```

the terminal will know that the page content (after the blank line that terminates the header) is in “chunked” format, which is as follows

```
HTTP/1.1 200 OK
Content-Type: text/plain
Transfer-Encoding: chunked

25
This is the data in the first chunk

1C
and this is the second one

3
con

8
sequence

0
(blank line)
```

Where xx is the length (hex byte count) of the data chunk on the following line. Content is terminated with a 0 data length and a following blank line. Notice that CR/LF can be included in the data chunks; termination MUST be a 0 chunk size followed by a blank line (CR/LF only).

If the data format is not chunked, then there will be a line like this in the header:

```
Content-Length: 1354
```

After being deciphered from whatever is the sending mode, data from the Host will always look like

```
wd*data:@1,1,1,Enter Data%04
```

Low-Level Terminal Command Script Reference

The basic format of a message that is transmitted from Host to Terminal is fairly simple:

Byte position	Function	Possible values
1	Unused	0 (zero)
2	Command(s)	(See Below)
Last	Termination of message	EOT (ASCII 4)

The first byte, **RF Terminal ID,** is unused and included for backwards compatibility, should you want to port existing RF Terminal applications to the new 7802 system. Leave this set to "0" (zero).

The reason that Terminal ID is not used has to do with the way the server works. You can never send anything to a Terminal unless the Terminal requests it, and the Server guarantees a direct one-to-one query-response integrity.

The **Command**(s) section of the message always starts with the second byte and can consist of one or more commands - including data to be displayed, batch program file upload, or voice messages to be broadcast.

The last byte is always ASCII 4 (**EOT**) to terminate the message.

Here is a listing of valid commands and examples:

Command characters	Command function
@B*n*	Make Terminal beep *n* (1-9) times
@C0	Clears the entire screen (4, 6 or 15 lines) on Terminal.
@C1	Clears line 1 on Terminal
@C2	Clears line 2 on Terminal
@C3	Clears line 3 on Terminal
@C4	Clears line 4 on Terminal
@C5	Clears line 5 on Terminal
@C7-@CF	Clears lines 7 through 15 on display.
@CX	Clears screen (same as @C0) and sets SMALL font, 15 lines with 26 characters per line
@CY	Clears screen (same as @C0) and sets MEDIUM font, 10 lines with 20 characters per line
@CZ	Clears screen (same as @C0) and sets LARGE font, 7 lines with 13 characters per line
@D*n*	Displays date and time on line *n* in US (mm/dd/yy, hh:mm:ss) or Euro (dd/mm/yy, hh:mm:ss) format on Terminal
@V*nn*	Play voice message #*nn* (01-99) on Terminal
@S*dataxxxx*	Output *dataxxxxxxx* to serial port on Terminal -max 231 chars
@P*dataxxxx*	Send Batch Program
@A	Acknowledge Batch Data

NOTE: The 15-line terminal defaults to small font on Sign-In.

Color Display Programming

New commands have been added to take advantage of the larger color display on the LT7001. You now have the ability to define the color and font size on a line by line basis.

There are 16 possible text and background colors available to choose from. They are the same 16 colors used in HTML programming.

The @C command has been expanded to set the foreground and background colors for the entire display and within the same command you can also set the font size for the entire display to all be the same or split up the display using different size fonts for each line.

The command structure is as follows:

@C[fnfnfn...][\cb]

Where:

@C are the 2 header bytes
f: is the font size and can be either S, M or L for small, medium or large
n: is the number of lines being defined
\cb: defines the user default colors, c=text color, b=background color

The \cb command can also change the active text/background color within a prompt at any time.

All screen formatting and color commands are dynamic and not stored in the unit so they will need to be sent at every sign-in.

The color codes are:

0 = AQUA	1 = BLACK	2 = BLUE	3 = FUCHSIA
4 = GRAY	5 = GREEN	6 = LIME	7 = MAROON
8 = NAVY	9 = OLIVE	A = PURPLE	B = RED
C = SILVER	D = TEAL	E = WHITE	F = YELLOW

Here are some examples:

@CS2M2L2

will clear the screen and set the first two lines of the screen to be small fonts, the next two lines to be medium fonts, and the next two lines to be large fonts. The remaining undefined lines will be small font with the default colors. The default colors will be used since there is no \cb at the end of the command.\

followed by:

@1,1,0,\BEWarning@3,1,0,\21Invalid Data@5,1,1,\ACData<EOT>

will display “Warning” on the first line in small font with RED text on a WHITE background, “Invalid Data” on the third line in medium font with BLUE text on a BLACK background and “Data” on the 5th line in large font with PURPLE text on a SILVER background. The cursor will be positioned after the “Data” on the 5th line and entered text will be in the last color combination, PURPLE on SILVER.

Remember that if you only define 6 lines then the remaining lines on the screen will be defined as small font with the default colors.

When you are defining the font size for each line of the screen be aware that the total pixel count of all the

lines defined cannot exceed the height of the screen.

The total height of the screen is 240 pixels. A small font is 16 pixels tall, a medium font is 24 pixels tall and a large font is 32 pixels tall.

If you define 2 lines with small fonts, 2 lines with medium fonts and 2 lines with large fonts you will be using (2x16)+(2x24)+(2x32)=144 pixels out of a maximum of 240 pixels. The top 144 pixels of the display will be used, the bottom 96 pixels will be divided into 6 lines (96/16=6) of small font..

If you attempt to define a combination of fonts that exceeds 240 pixels total, a ? will be returned to the host for invalid command.

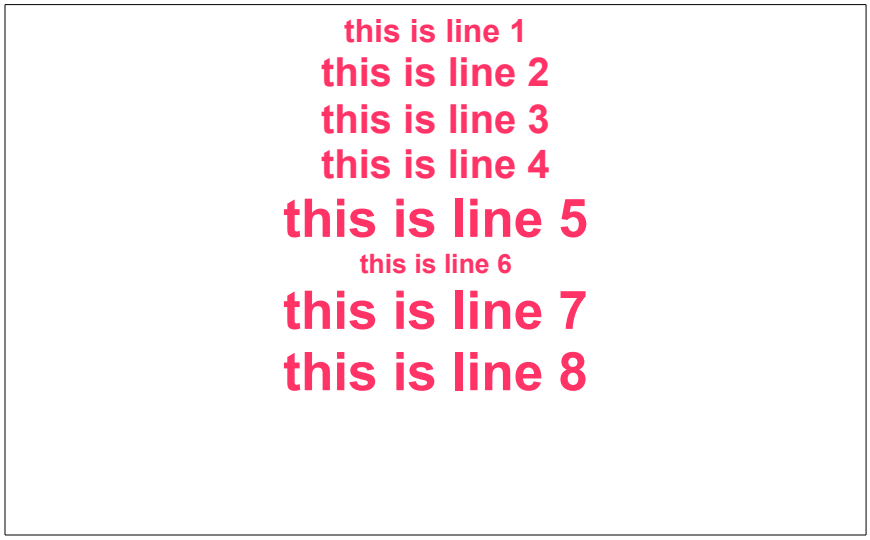
Here are some more examples:

@C\E1

will clear the screen and set the default colors to WHITE text on a BLACK background. In concept, @C\E1 is the same as @C0\E1; however, @C0\E1 is an invalid command. The change of user colors is always embedded in a Clear Screen Command.

@CS1M3L1S1L2\BE

will clear the screen and set the first line to be small font, the next 3 lines to be medium font, the next line to be large font, the next line to be small font and the last two lines to be large font with RED text on a WHITE background for all lines. The total height of the lines will be (1x16)+(3x24)+(1x32)+(1x16)+(2x32)=200 pixels:



The active colors change whenever \cb is received in a prompt. The user default will be used to display all the prompts unless \cb changes the colors. All prompts will start with the user default. The active colors from the last prompt will NOT be carried over to the next prompt.

Prompts Display Programming

A typical “prompt” command sequence follows the format below:

@n,m,o,*data*

where	***n***	is the line number (1-F) you want the prompt displayed on
	m	is the character position (1-20) where you want the prompt displayed
	o	is the character that determines whether the prompt is for ***display only*** (0) or is ***waiting for data input*** (1) See the table below for valid characters for this position.
	data	is the data you want displayed

For example, the command **@1,1,1, Enter Quantity** would display **Enter Quantity** starting at position 1 on line 1, then wait for the operator to enter their data.

These are valid entries for the third position character:

0	No data input for this Command, Display ONLY
1	Data input required from the keypad or scanner
2	Only keypad input allowed, start un-shifted
3	Only keypad input allowed, start SHIFTED
4	Only scanner input allowed
5	Only accept YES (Enter key or C key) or NO (0 key or B key) keypad response. (Terminal sends 1 for YES, 0 for NO). C and B key are there to facilitate YES/NO keypad entry while scanning with integrated laser.
A	same as 1, but time stamped as prefix (hhmmss)
B	same as 2, but time stamped as prefix (hhmmss)
C	same as 3, but time stamped
D	same as 4, but time stamped
E	same as 4, but can press END key to break-out of scanner-only input mode. Terminal ID + CR is sent to host
S	SHIFTED keypad input or scanner input
p	un-shifted keypad entry with no display (for passwords)
P	SHIFTED keypad entry with no display (for passwords)
R	Data input required from the RS-232 serial port (waiting for serial input can be bypassed by pressing the ENTER key which will send a NULL data string back to host computer.) Uses for this are PDF 417 Serial Scanners, and the Cameo Printer's magnetic stripe input. A POS terminal becomes possible. Scan the credit card and print the receipt, all on the RF Terminal.
K	Data input from an external serial keyboard that attaches to the serial port. As data is keyed, the characters are displayed on the RF Terminal LCD display.
M	This command is for a printer initialization and magstripe input on the Zebra Cameo printer equipped with the magstripe option.

Here are some rules and useful tips for creating messages (one or more commands per message):

- A message with multiple commands is legal and useful. For example, the command "@1,1,0, PLEASE ENTER@2,1,1,QTY" would display PLEASE ENTER on line 1, display QTY on line 2, and then wait for data input. All 6 lines can be filled with one message.

- Messages can be a combination of multiple commands, (i.e. voice messages, initialization, clearing lines, requesting data entry), up to 1000 characters in length. A message cannot though, contain an @S command in combination with any other command. A message also ***should not*** contain more than 1 request for data entry (third character in command is **1**). For example:

  @1,1,1,ITEM@2,1,1,QTY

  has two data entry "prompt" commands combined. If this message were sent to the RF Terminal, the first data entry prompt (**@1,1,1,ITEM**) would be executed, but any and all commands after the first data entry prompt in that statement would be ignored without warning – there will be no display or indication of an illegal command.

  The **@S** command (for serial output) statement ***cannot*** be combined with any other command - even clear (**@C*x***) commands. After a **@S** command is successfully completed, the Terminal sends back to

the host the RF Terminal ID followed by a CR (ASCII 13). There is a 231 character limit on data for this command. If you send a command of more than 231 characters, you will get an Illegal Command returned, (ID ? CR). If you need to send 300 characters of data, send the first part, wait for the acknowledgement (ID CR), and then send the remaining part. If you are using the **@S** command with a printer *other* than the Zebra Cameo or QL3, you may have to change the ***Protocol*** parameter in the RF Terminal to **XON/XOFF**. This will allow the RF Terminal to deal with the character buffer limitations of your particular printer. If you are using the O'Neil MicroFlash Printer, you must send a **NULL** character before the valid data to wake up the printer. See your printer manual for details and see **Chapter on Portable Printers** for details on printer protocol.

- The @M command is similar to the @S command, except it ***can*** be combined with other commands because it is a data entry command too. This command is for a printer initialization and magstripe input on the Zebra Cameo printer equipped with the magstripe option. The format of the command is:

  @Mdddatttta**(EOT)**

  where dddatttta might be ! U1 MCR 80 T1 T2+ *CR* + *LF*

  (Refer to the Cameo manual for the exact string sequence you need to send. The above example sends over an 10 second request for reading Track 1 and Track 2).

  There is no reply to the host except the magstripe data. If the card cannot be read, pressing the ENTER key on the Terminal will send back ID+CR. This is the breakout method.

  This command must be the last in a series of commands. For example, the following would be a typical multi-command statement:

  @C0@1,1,0,Swipe Card@M! U1 MCR 80 T2 (CR)(LF)(EOT)

  where:
  CR is ASCII 13
  LF is ASCII 10
  EOT is ASCII 4

  The statement causes the RF Terminal to transmit the string "!U1 MCR 80 T2 CR LF" to the Cameo printer. The printer then wakes up and blinks to indicate the magstripe input is ready to be swiped; when the swipe is complete, the Terminal sends back the data to the host computer as:

  ID+T2:Data on Card+CR (the printer's CR LF stuff is stripped)

  If the request is for Track 1 and Track 2, the data sent back is

  ID+T1:data on 1+T2:data on 2+CR

- Every statement must end with a data entry "prompt" command, whether the statement is a single command by itself or several commands combined together. Any illegal statement will be ignored as a command but will be displayed on the addressed RF Terminal display exactly as written. If no Terminal ID was included in the statement, it will try to display the invalid statement on ID 0. Once the ENTER key is pressed on the Terminal displaying the invalid statement, the terminal sends the Host a "?" character.

Here are some sample command statements utilizing some of the programming tips offered above:

@2,1,1,ENTER ITEM NO	Display **ENTER ITEM NO** on line 2, position 1 and wait for wait for data input. This is a ***valid*** single command ***statement*** – it ends with a data entry request.
@V23@1,2,1,WRONG ITEM	Play voice message 23, display **WRONG ITEM** on line1, position 2 and wait for data input. This is a ***valid*** multiple command ***statement*** – it ends with a data entry request.
@C1@1,7,0,PICKING	Clear line 1. Display **PICKING** at position 7 of line 1. This statement is **illegal.** To be a valid statement, it must end with a data entry request. For example: **@C1@1,7,0,PICKING@2,7,1,ITEM**
@1,1,1,ITEM@2,1,1,QTY	Since only one command can be a "prompt" data entry request, this is an ***illegal statement*** and would be ignored as a command. It would be valid if changed to **@1,1,0,ITEM@2,1,1,QTY**

Terminal to Host Formats

The basic format of a message that is transmitted from Terminal to Host is simple:

Byte position	Function	Possible values
1	Data Transmitted	**
Last	Termination of message	CR (ASCII 13)

Typically, the Terminal is sending the "answer" to the hosts "question" - for example, if a Host sent a message to a terminal that said:

@1,1,1,ITEM NUMBER + EOT

The RF Terminal would display ITEM NUMBER on line 1, position 1 and accordingly, the operator would then enter an item number by scanning or using the keypad. The RF Terminal transmits the data entered -say it's **123** - to the host:

123+CR

Where **123** is the data and **CR** is the termination, (the plus sign is not transmitted).
Besides data, there are other messages that the Terminal will send to
the Host:

Serial Reply

After a **Serial** command (**@S**) has been successfully completed, the Terminal sends to the Host a CR. Serial commands are typically used for attached serial printers. Serial commands cannot be combined with other commands in a message to the Terminal. Remember, you can only send 231 characters (including the 0 + @S + EOT).

SIGN ON

To login to the host computer, the user presses a key on the RF Terminal at power-up to get to the SIGN ON screen. As the user SIGNs ON, the Terminal sends the following SIGN ON message to the host:

Byte position	Function	Possible values
1	SIGN ON	SYN (ASCII 22) if 15 line display configured as a 15 line display.
		SI (ASCII 15) if 15 line display terminal configured as 15 line display.
		DC4 (ASCII 20) if 15 line display configured as a 15 line display.
Last	Termination of message	CR (ASCII 13)

After a terminal SIGNS ON, the host should be prepared to acknowledge the SIGN ON and give the terminal instructions, such as:

Standby for Assignment, Press ENTER to acknowledge
Nothing to do, Press ENTER and See Supervisor
Pick Item 1234

If there is something for the Terminal to do, the host should send instruction to the terminal (as in "Pick Item 1234" above). If there is nothing to do at the time of SIGN ON, the host should acknowledge the SIGN ON and tell the terminal to *Stand By* or *See Supervisor* (see lines 1 and 2 above). You will notice that in lines 1 & 2 above, there is a request for the operator to press the ENTER key. This is required for the message to be a valid command - remember that all messages must end with a request for data input. The host should then expect a response from the terminal of DATA (none if only pressing ENTER key) + **CR**.

SIGN ON is a good way for the terminal operator who has not received instruction from the host for several minutes to determine if he is still connected and if the host is still functioning. By SIGNing OUT and SIGNing back ON, the operator should receive a message that there is nothing to do. It is also a good idea for the host to keep track of elapsed time that a terminal has not had a message sent out to it. The host should then send a message periodically to re-assure the operator (remember to ask him to press ENTER) that instruction is coming or tell him to see his supervisor for re-assignment (or whatever makes sense for your application).

Ideally, if the operator is leaving the area (to go to lunch or move to another building) before he is out of range of the network, he should SIGN OUT, then SIGN ON upon his return.

SIGN OUT

When a RF Terminal is powered down manually or the user presses the F1 key to exit data entry mode to go to one of the other modes (SETUP or ONE WAY), the host receives the following SIGN OUT message:

Byte position	Function	Possible values
1	SIGN OUT	SO (ASCII 14)
Last	Termination of message	CR (ASCII 13)

Connection Host Error Feedback

If you are using the ActiveX control in your Application Server, you can periodically check for any error codes present by calling GetErrorCode. Codes are set for Warning and Error conditions on the Connection Host. Look at the log file (if you have the ActiveX configured to generate one) for details on the error codes.

Code	Level	Possible values
0	Nothing to report	0-9, A-Z, a-z, - =
3	Error	Serial Output Data Too Long
7	Connection Host Warning	*deleted FromTerminal records on SignIn* *deleted FromServer records on SignIn* *Sequence Error, data already present from this terminal* *Timed out waiting for data from Application Server*
8	Connection Host Error	*Couldn't execute query xxx* *Couldn't add data to xxx table* *Couldn't read from xxx table* *Couldn't delete data from xxx table*

Illegal Command

When a terminal receives an illegal statement from the host, it will display the entire statement on the terminal. Once the ENTER key is pressed on the terminal, the terminal sends a "?" back to the Host.

Byte position	Function	Possible values
1	Illegal Command	?
Last	Termination of message	CR (ASCII 13)

For example, if Terminal a received an illegal command, the it would transmit to the host:

?CR

If the Terminal receives more than 1000 characters, it treats that statement as an Illegal Command.

Automatic Check Back

When a terminal checks back in to see if there is a change in instructions, the host can send back the same prompt or send back a new prompt. The check back occurs according to the time specified in the Terminal's setup, (specified in increments of 5 seconds). When a check back occurs, the Terminal clears the screen of

the current prompt, and sends back the following message:

Byte position	Function	Possible values
1	Check Back	BEL (ASCII 07)
Last	Termination of message	CR (ASCII 13)

Control Keys for Possible Programming

There are some keys on the 7802 RF Terminal keypad that when pressed, can transmit special ASCII characters back to the host program. This feature might be used by a programmer to allow the operator to review transactions. **You can use these keys for special program functions, such as scrolling through data, backing up steps, jumping, finishing a process, etc.** The keys are as follows:

Key	Code transmitted to Host
UP ARROW key	FS (ASCII 28)
DOWN ARROW key	GS (ASCII 29)
LEFT ARROW key	RS (ASCII 30)
RIGHT ARROW key	US (ASCII 31)
BEGIN key	ETB (ASCII 23)
END key	CAN (ASCII 24)
SEARCH key	VT (ASCII 11)

The STATUS key is reserved to only display the Time and Date.
The Control keys can be used *without* pressing the ENTER key by using the **Control Keys Only** Terminal Setup parameter. See the chapter on *RF System Setup* for details.

WD7802Term/ActiveX

WD7802Term is a drop in ActiveX component that allows programmers to easily add the ability to send prompts to and receive data from their R/F Terminal across a wireless 802.11 Ethernet network connection.

The ActiveX component is compatible with Visual Basic, Visual C++, Delphi, and most other 32-bit development platforms.

Make sure you compiler is set to generate 32-bit compatible files.

Programming Considerations

Network Setup

- The network settings on the server must support TCP/IP communications.

- It is critical that the Terminals (via one or more Access Points), Connection Host and Application Server are "visible" to each other across your network. Terminals, Connection Host and Application Server must have IP addresses in the same subnet. The Connection Host and Application Server should have static IP addresses (that do not change) while the Terminal(s) can either have a static address or use an assigned IP address via a DHCP server or equivalent. Refer to your Windows networking administration utility in the Control Panel to configure computer IP address settings.

- **WD7802Term** uses an assignable IP port. The default is 80.

- If you are unsure of how to set up your IP configuration properly, refer to your network administrator for help.

Server Communications

- Run the Hardware Utilities 7802 Test Program on the server computer. Now go to a Terminal and attempt to SIGN IN to the Test Program. If the terminal connects and responds with a prompt “Scan Item”, you are configured properly.

- Make sure you set the ConnectionHostAddr property to the desired web address or local IP address of the computer on your LAN running the Windows-based Connection Host. Use
  www.worthdata.net/connect/server.php
  if you are unsure.

- Make sure you set the Username, Password, and ServerID properties in the ActiveX to match the settings in your Terminals.

- Before making any **WD7802term** method calls in your application, make sure to turn the Server on by calling

```
WD7802Term.InitializeServer
WD7802Term.ServerActive = True
```

Test For Good Communication

- Implement an event handler for **OnTermSignIn** that causes a beep or displays a message when called. If communication between the host PC and the terminal is good, your event handler will fire when your program is running and you sign in a terminal on your network.

Terminal Tracking

- Since you get only one set of event handlers, you will need some scheme for keeping track of where each terminal (up to 1000) is in its transaction sequence. Remember, **WD7802Term** will give you a unique ID number for each Terminal that signs in and that number is “locked” to that Terminal until it signs out. One possible solution is to use a "state" variable for each terminal (perhaps stored in an array). Test the state variable to determine the next prompt for any given terminal. See the samples for more ideas.
- It is very important to keep track of "login status" for each terminal. Every **SignOut** event should have an associated **SignIn** event and a given terminal should not be allowed to **SignIn** twice without and an intervening **SignOut**. Multiple **SignIns** from one terminal without appropriate **SignOuts** indicate either:

    1. A terminal going out of range and having its power cycled before returning within range OR
    2. Two (or more) terminals using the same IP address (terminal ID conflict).

Real-Time vs. Batch Mode Operation

It is possible to build a system that operates in only Real-Time mode or only in Batch Mode. It is also possible to build a system that can operate in either mode.

Real-Time and Batch mode can be combined since sending a batch program is just like sending a prompt, and receiving data from a batch program is just like receiving data from a prompt response. It is also possible to create a program that allows the Terminal operator to decide and choose whether to operate in Batch mode or Real-time mode.

It is important to understand that operating in Batch mode requires some identification scheme for each data field. This is because there is no way to maintain or guarantee a 1:1 prompt-data relationship when receiving Batch data, as opposed to receiving Real-time data. The easiest way to do this is to assign data prefixes for each data collection statement in the Batch program and have your application use the prefixes to sort out what each piece of data is for.

Concepts – WD7802Term ActiveX

Drop-in components are tools that are added to your programming environment "tool kit". Only the ActiveX variety are widely compatible with almost all development environments. When you use drop-in components in your program you will follow the standard object-oriented programming paradigm that uses properties, methods, and events to implement the functionality of the drop-in component.

Properties are the various configuration variables used by the drop-in component. An example of a property is the **ServerActive** setting.

Methods are function calls used to issue commands and access features of the drop-in component. An example of a method is sending an **Input** command to the terminal.

Events are function definitions placed in your application's source code. The function definitions in your source code are called Event Handlers. The skeleton structure of the event handler's source code is automatically generated. The code in the Event Handler is called ("fired") by the drop-in component when a specific event occurs. An example of an event is when a terminal returns data and the **OnTermData** event is fired.

The details of how to access Properties/Methods/Events varies between development platforms. Details of how it works in some of the most popular platforms is illustrated in the samples included with the RF Utilities CD or available for download from our website at **www.barcodehq.com**

Properties – WD7802Term ActiveX

Properties are the various configuration variables used by the **WD7802Term** control. They are directly assignable in your application (eg. "WD7802term.ServerOn = true") and can be set in your development environment's object browser.

Note that your development environment may show more properties for the **WD7802Term** control than are listed here. This is normal. You may ignore properties you see listed in your development environment that are not listed here.

ActiveTerminal *(deprecated)*

Valid values: *0 -999*
Definition: Provided for backwards compatibility. Terminal ID is now required as a parameter for all relevant method calls so setting ActiveTerminal is redundant.

This is the terminal ID (0-999) to which method call instructions are directed. Terminal ID "number" is mapped to actual terminal IP address dynamically.

See method "GetIPAddress" to get terminal IP address associated with an ID.

Keep in mind that unless your terminal is configured with a static IP address, each time it is powered on it can have a different IP address (issued by your DHCP server). Also, regardless of the terminal's IP address, it can be assigned a different ID (by WD7802Term) each time it Signs On to the server. Keep this in mind and design your application accordingly if you require specific physical terminals to perform specific individual tasks.

MaxPkgLen

Valid values: 255,1000
Function: Defaults to 1000. Set to limit prompt size sent to Active Terminal. Does not effect **SendBatchProgram**.

ServerPort

Valid values: *1-65536*
Function: Use **ConnectionHostPort** instead. Set to 80 by default for standard internet operation. Do not change unless you know exactly what you are doing. If you are not familiar with IP ports, leave this value at the default setting.

ConnectionHostAddr

Valid values: *Any valid IP address or web site address (URL)*

Function: Set to *www.worthdata.net/connect/server.php* by default for standard internet operation. Do not change unless you know exactly what you are doing. If you are not familiar with IP addresses and URLs, leave this value at the default setting.

ConnectionHostPort

Valid values: *1-65536*

Function: Set to 80 by default for standard internet operation. Do not change unless you know exactly what you are doing. If you are not familiar with IP ports, leave this value at the default setting.

Username

Valid values: *Any alpha-numeric combination up to 12 characters*

Function: Part of Application Server access key system. In order to connect with an Application Server, settings for Username, Server ID, and Password must all be set identically in the Application Server and all Terminals that use this Application Server.

ServerID

Valid values: *Any alpha-numeric combination up to 12 characters*

Function: Part of Application Server access key system. In order to connect with an Application Server, settings for Username, Server ID, and Password must all be set identically in the Application Server and all Terminals that use this Application Server.

Password

Valid values: *Any alpha-numeric combination up to 12 characters*

Function: Part of Application Server access key system. In order to connect with an Application Server, settings for Username, Server ID, and Password must all be set identically in the Application Server and all Terminals that use this Application Server.

InternalPolling

Valid values: *True, False*

Function: Default value is True. Set InternalPolling to True to instruct the ActiveX control to poll the Connection Host for incoming data. Some environments, like Visual Basic and Excel do not work with internal polling and you must set InternalPolling to False and set up a timer in your application to drive Server polling through calls to the PollServer method (see below).

PollInterval

Valid values: *50-5000*

Function: Default value is 1000. Sets the server polling cycle time in milliseconds. Setting a shorter interval, such as 200 or 500 mSec will speed up the terminal response time but increase your network traffic. This setting is ignored if InternalPolling is false.

ServerActive

Valid values: *True, False*

Function: Set ServerActive to True to begin listening for terminals. Before setting to True, be sure

to call the InitializeServer method (See Methods)

LogFileName

Valid values: *Any valid file path and name*
Function: Leave blank if you do not want a log file kept. If you enter a filename here, WD7802Term will create the file (or add to it if it already exists) in standard text file format that you can open using Windows Notepad.
NOTE: Using a log file, especially a large one, uses resources on your computer and can result in increased response time and in some cases more connection errors for your terminals.

LogFileSize

Valid values: *1000 through 2GB (2000000000)*
Function: This is the maximum log file size that WD7802Term will keep. If the file exceeds this size, the oldest entries are removed to make room for new entries.

Quiet

Valid values: *True, False*
Function: If **Quiet** is set to *True* then any status and error message generated by **WD7802term** will be suppressed.

Verbose

Valid values: *Ture, False*
Function: Set to **True** for more detailed log entries.

Methods – WD7802Term ActiveX

Methods are commands that you issue to the **WD7802term** control. All of the "**Inputxxx**" commands cause the terminal to wait for operator input.

*Note that your development environment may show more available methods for the **WD7802term** control than are listed here. This is normal. You may ignore methods you see that are not listed here.*

Except for the **ReInitAll** method, all methods use the **ActiveTerminal** property to identify the terminal to use.

Color Codes for 7802 Terminal

0 - aqua
1 - black
2 - blue
3 - fuchsia
4 - gray
5 - green
6 - lime
7 - maroon
8 - navy
9 - olive
10 - purple
11 - red
12 - silver
13 - teal
14 - white (white)
15 - yellow

InitializeServer

Parameters: *none*

Function: Prepares the Server to be started. Follow this call by setting the ServerActive property to True. This must be called before any of the methods described below.

DefineFormat

Parameters: *font, linecount*

Function: Adds a line formatting definition. This command is called multiple times to build a display formatting definition for multiple lines which is then sent to the **ActiveTerminal** by the **SendFormat** command.
If only one line is defined (that is DefineFormat is called only once), then after SendFormat is called, only one line will be available for display on the ActiveTerminal. There are a limited number of lines available depending on the font size(s) chosen. Each font has a defined height:

small: 16
medium: 24
large: 32

The total height of the defined lines cannot exceed 240. If it does, an error code is generated (see CheckError) and the SendFormat command is ignored.

There is limited display width available for text. Depending on the font you select for a line:

small: 26 characters
medium: 20 characters
large: 13 characters

If you try to send prompt or display text longer than this, it will be truncated and an error code is generated (see CheckError).
Must be followed by a **SendFormat** and then an **Input** call to take effect.

SendFormat

Parameters: *termID, FGcolor, BGcolor*

Function: Sends to the **ActiveTerminal** the current Format Definition as created by one or more calls to the DefineFormat method. It also sets the user-default display foreground and background colors.
Must be followed by an **Input** method call to take effect.

InputAnyColor

Parameters: *termID, line, position, prompt, shifted, timestamped, FG, BG*

Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be entered from either terminal keypad or scanner. If shifted is set to "true", the terminal will start in shifted mode. Timestamped appends a (hhmmss) prefix to the returned data. FG and BG are ForeGround and BackGround color, see table above for key.

InputAny *(deprecated)*

Parameters: *termID, line, position, prompt, shifted, timestamped*

Function: Provided for backward compatibility. Use *InputAnyColor* for new applications

InputKeyBdColor

Parameters: *termID, line, position, prompt, shifted, timestamped, FG, BG*
Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be entered from the terminal keypad only. FG and BG are ForeGround and BackGround color, see table above for key.

InputKeyBd *(deprecated)*

Parameters: *termID, line, position, prompt, shifted, timestamped*
Function: Provided for backward compatibility. Use *InputKeyBdColor* for new applications

InputExtKeyBd

Parameters: *termID, line, position, prompt*
Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be received from the PS/2 keyboard attached using an adaptor to the terminal serial port. Waiting for external keyboard input can be bypassed by pressing the enter key on the terminal which will send an empty data string to the host (fires the OnTermData event handler). External keyboards are supported by terminals using firmware version RFU1010 or later.

InputScannerColor

Parameters: *termID, line, position, prompt, allowbreakout, timestamped,FG,BG*
Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be entered from the terminal scanner only. Setting allowbreakout to true allow user to "breakout" of scanner only mode by pressing the end key on the terminal. A termID+CR will be sent to the host. FG and BG are ForeGround and BackGround color, see table above for key.

InputScanner *(deprecated)*

Parameters: *termID, line, position, prompt, allowbreakout, timestamped*
Function: Provided for backward compatibility. Use *InputScannerColor* for new applications

InputYesNoColor

Parameters: *termID, line, position, prompt, FG,BG*
Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for a Yes (Enter key or C key) or a No (0 key or B key) from the terminal keypad. FG and BG are ForeGround and BackGround color, see table above for key.

Note: C and B keys are used to facilitate keypad entry while scanning with the integrated laser.

InputYesNo *(deprecated)*

Parameters: *termID, line, position, prompt*
Function: Provided for backward compatibility. Use *InputYesNoColor* for new applications

InputPasswordColor

Parameters: *termID, line, position, prompt, shifted,FG,BG*
Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for

data to be entered from the terminal keypad only. The entered data is not displayed on the terminal. FG and BG are ForeGround and BackGround color, see table above for key.

InputPassword *(deprecated)*

Parameters: *termID, line, position, prompt, shifted*
Function: Provided for backward compatibility. Use *InputPasswordColor* for new applications

InputSerialColor

Parameters: *termID, line, position, prompt,FG,BG*
Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be received through the terminal serial port. Waiting for serial input can be bypassed by pressing the enter key on the terminal which will send an empty data string to the host (fires the OnTermData event handler). FG and BG are ForeGround and BackGround color, see table above for key.

InputSerial

Parameters: *termID, line, position, prompt*
Function: Provided for backward compatibility. Use *InputSerialColor* for new applications

OutputSerial

Parameters: *termID, data*
Function: This instructs the ActiveTerminal to send data to the terminal's serial port. Data must be less than 232 characters in length for each call to OutputSerial. If you are sending data to a printer attached to the terminal, make sure to set the Protocol parameter in the 802 RF Terminal to XON/XOFF. See the 802 RF Terminal Manual for details.

Special Considerations:

- After an OutputSerial call is successfully completed, the terminal will return (as data) a CR (ASCII #13 Carriage Return). This will fire the OnTermData event. If there is a problem with the serial data you will see an error message at the client and in the log (if enabled). If the data string is too long, the OnTermIllegalCommand event will be fired.
- Do not call OutputSerial for the Terminal again until a return code is received.
- Do not call an Inputxxx method for the same Terminal until a return code is received.
- If you need to send more than 232 characters, send the first part, wait for the acknowledge (#13) and then send the next part.
- Calls to OutputSerial cannot be combined with other method calls.

SendDisplayColor

Parameters: *termID, line, position, prompt, FG, BG*
Function: This instructs the ActiveTerminal to display the prompt at line and position. Must be followed by an "Input" method call to take effect. FG and BG are ForeGround and BackGround color, see table above for key.

SendDisplay *(deprecated)*

Parameters: *termID, line, position, prompt*
Function: Provided for backward compatibility. Use *SendDisplayColor* for new applications

ClearScreen

Parameters: *termID*
Function: This instructs the ActiveTerminal to clear its display. Must be followed by an "Input" method call to take effect.

ClearLine

Parameters: *termID, line*
Function: This instructs the ActiveTerminal to clear the specified line on its display. Must be followed by an "Input" method call to take effect.

SendDateColor

Parameters: *termID, line, FG, BG*
Function: This instructs the ActiveTerminal to display date and time on the specified line number. Must be followed by an "Input" method call to take effect. FG and BG are ForeGround and BackGround color, see table above for key.

SendDate *(deprecated)*

Parameters: *termID, line*
Function: Provided for backward compatibility. Use *SendDateColor* for new applications

Beep

Parameters: *termID, count*
Function: This instructs the ActiveTerminal to beep count times. Count may be a value from 1 to 9. Must be followed by an "Input" method call to take effect.

PlayVoice

Parameters: *termID, msgnum*
Function: This instructs the ActiveTerminal to play voice message number msgnum. Msgnum may be a value from 1 to 99. Must be followed by an "Input" method call to take effect.

ReInit

Parameters: *termID*
Function: This instructs the ActiveTerminal to re-initialize. Must be followed by an "Input" method call to take effect.

ReInitAll

Parameters: *none*
Function: Instructs all attached terminals to re-initialize.

OutputRaw

Parameters: *termID, data*
Function: This allows you to override all of WD7802Term's Input methods (or any other method, for that matter) and send whatever data you want to the Active Terminal. This is most

useful for adapting old DLL-based code to use the new ActiveX system.

MapTermID

Parameters: *TermNumber*
Function: Returns the actual terminal ID letter code for a given terminal number. Use the returned character to match with the Terminal ID programmed into a non-802 RF Terminal. This is provided for backwards compatibility and should not be used for new host applications.

GetMACAddress

Parameters: *TermNumber*
Function: Returns the actual MAC address of the terminal associated with a given ID code.

SendBatchProgram

Parameters: *termID, File Name*
Function: Send the batch program indicated by the file name (which should include complete path) to the Active Terminal.

SendBatchDataACK

Parameters: *termID*
Function: Sends "@A" to Active Terminal to indicate that the Application Server has received the data and that the Terminal should continue operating in Batch Mode.

PollServer

Parameters: *none*
Function: Instructs the ActiveX control to poll the Server for any waiting data. If the *InternalPolling* property is set to False, *PollServer* should be called approximately once per second.

GetErrCode

Parameters: *none*
Function: Returns code for the most recent error. Calling this method resets the Error Code to 0.
Error Codes

0. No Error
3. Serial Out Data Too Long
6. Requested display height greater than 240 pixels
7. Connection Host Warning (see application server log)
8. Connection Host Error (see application server log)

Events – WD7802Term ActiveX

WD7802term events occur when a specific condition is met. When an event is "fired", an event handler function in your application is called.

Though the details of exactly how it is done varies from one programming environment to the next, the source code skeletons for the various event handlers are automatically generated and inserted into your source code for you. See the samples for more specific information.

Each event passes relevant information to your event handler function. For example, **OnTermData** passes the data that was keyed or scanned into the terminal.

Terminal ID is always passed as 0-999.

Once you have the event handler skeletons, you can proceed to add whatever functionality you desire to each event.

Before any **WD7802term** events will fire, you must make sure to turn the Server on by calling

```
WD7802Term.InitializeServer
WD7802Term.ServerActive = True
```

OnServerActivate

Data passed: *none*
Event: Called when the ServerActive property is set to True immediately after the Server begins listening for terminals.

OnTermSignIn

Data passed: *terminal*
Event: A terminal has signed in. Terminal ID is passed in *terminal*.

OnTermSignOut

Data passed: *terminal*
Event: A terminal has signed out. Terminal ID is passed in terminal.

OnTermData

Data passed: *terminal, data*
Event: A terminal has sent *data* in response to an **Input** or **SendBatchProgram** method call.

OnTermNotSignedIn

Data passed: *terminal*
Event: A command has been sent to a *terminal* that is not signed in.

OnTermSequenceError

Data passed: *terminal*
Event: The *one-for-one host prompt/terminal response* protocol has been violated. The host cannot send a second Input command until it has received a response from the first Input command. If WD7802Term receives 5 sequence errors in a row, a Host Logic

error is generated and the server shuts itself down.

While WD7802Term/ActiveX will intercept and prevent most logic errors, they are still possible so you should implement this event handler!

OnTermIllegalCommand

Data passed: *terminal*
Event: An illegal command has been sent to a terminal.

WD7802Term /ActiveX is designed to prevent illegal commands but software is not always perfect and we may not have imagined all the ways in which our customers will want to use it!

OnTermUpArrow

Data passed: *terminal*
Event: The up-arrow button has been pressed on a terminal. You must issue another Input method call before WD7802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press an arrow key, this event will not fire.

OnTermDownArrow

Data passed: *terminal*
Event: The down-arrow button has been pressed on a terminal. You must issue another Input method call before WD7802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press an arrow key, this event will not fire.

OnTermLeftArrow

Data passed: *terminal*
Event: The left-arrow button has been pressed on a terminal. You must issue another Input method call before WD7802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press an arrow key, this event will not fire.

OnTermRightArrow

Data passed: *terminal*
Event: The right-arrow button has been pressed on a terminal. You must issue another Input method call before WD7802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press an arrow key, this event will not fire.

OnTermBeginKey

Data passed: *terminal*
Event: The BEGIN button has been pressed on a terminal. You must issue another Input method call before WD7802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press the Begin key, this event will not fire.

OnTermEndKey

Data passed: *terminal*

Event: The END button has been pressed on a terminal. You must issue another Input method call before WD7802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press the End key, this event will not fire.

OnTermSearchKey

Data passed: *terminal*

Event: The SEARCH button has been pressed on a terminal. You must issue another Input method call before WD7802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press the Search key, this event will not fire.

Chapter 6: Batch Programming

Create custom Terminal Batch Program files on your PC that are ready to send to your terminals using your the Application Server that you write using the provided ActiveX control.

Use the ***Batch Program Editor*** in the ***Integrated Hardware Utilities***.

Installing the *Hardware Utilities*

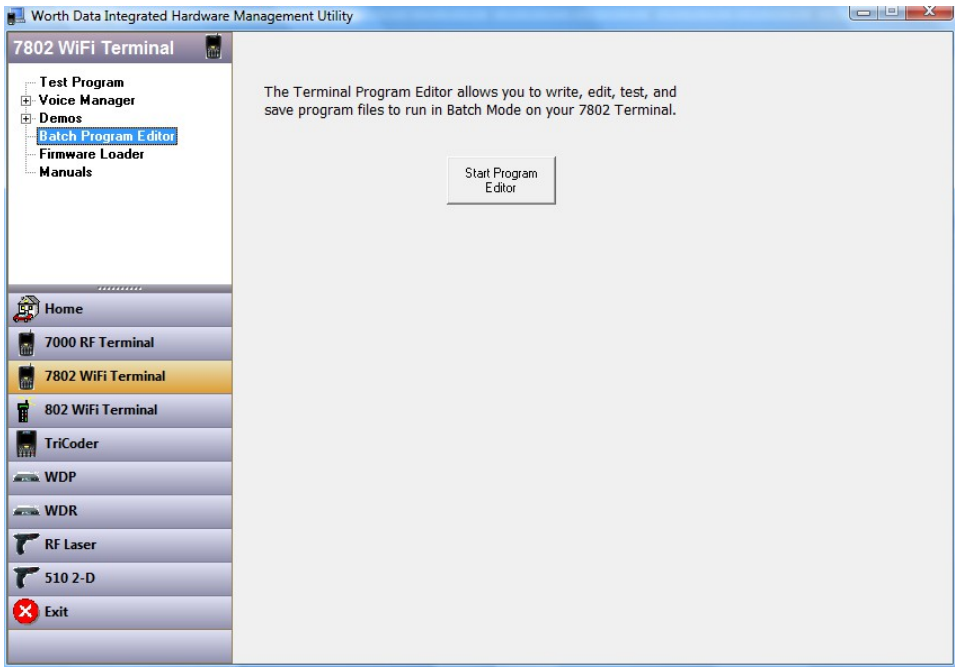
- Insert the **Worth Data Utilities** CD-ROM into your CD-Rom drive on your computer running Windows.
- If you have autoplay enabled, the CD should begin by itself. If not, Click on **Start**, then **Run,** then type D:\setup.exe at the prompt (use your drive letter in place of "D" if it is different).
- Follow the directions on screen to install the ***Integrated Hardware Utilities***

Starting the *Hardware Utilities*

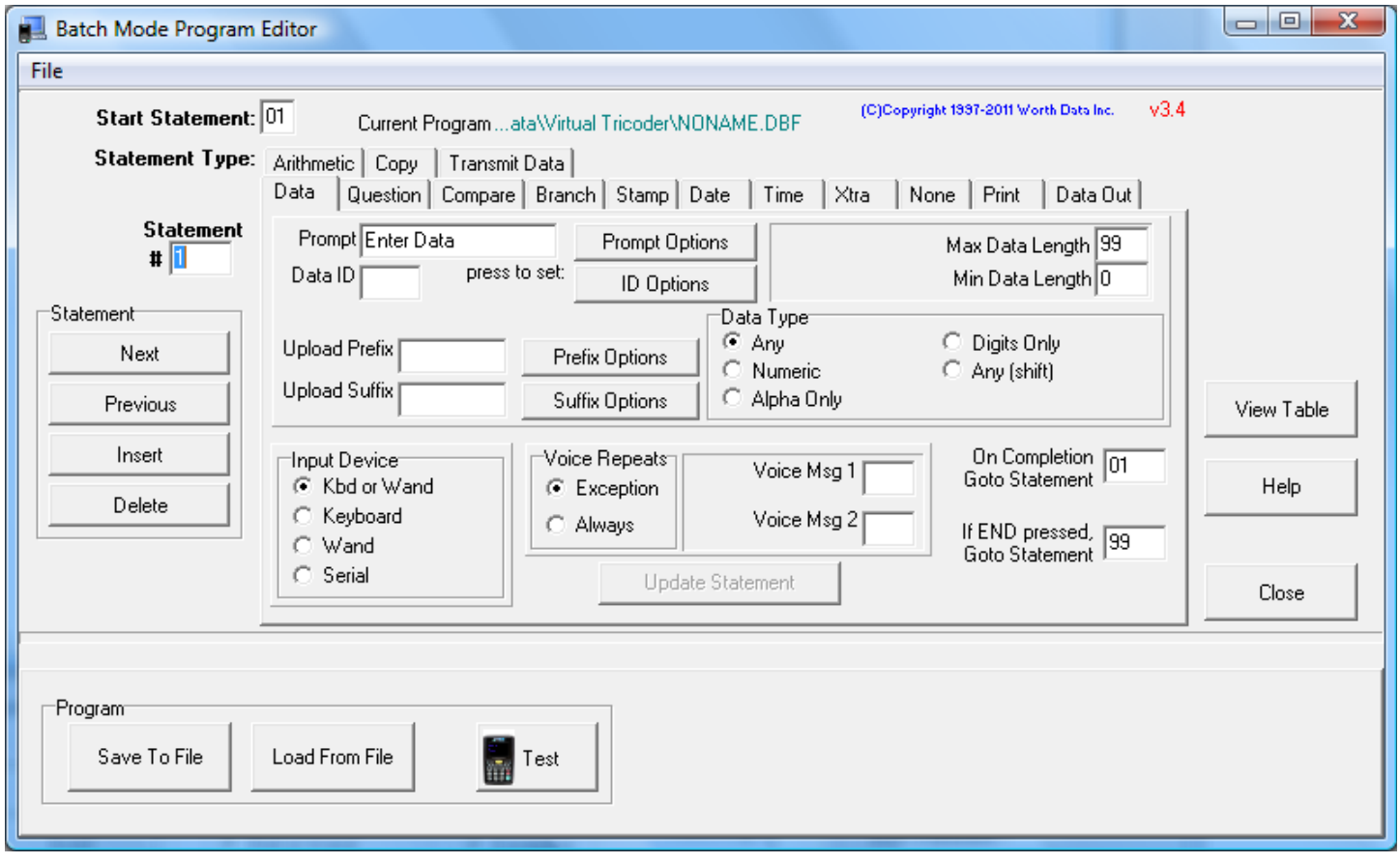
To start the ***Hardware Utilities***:

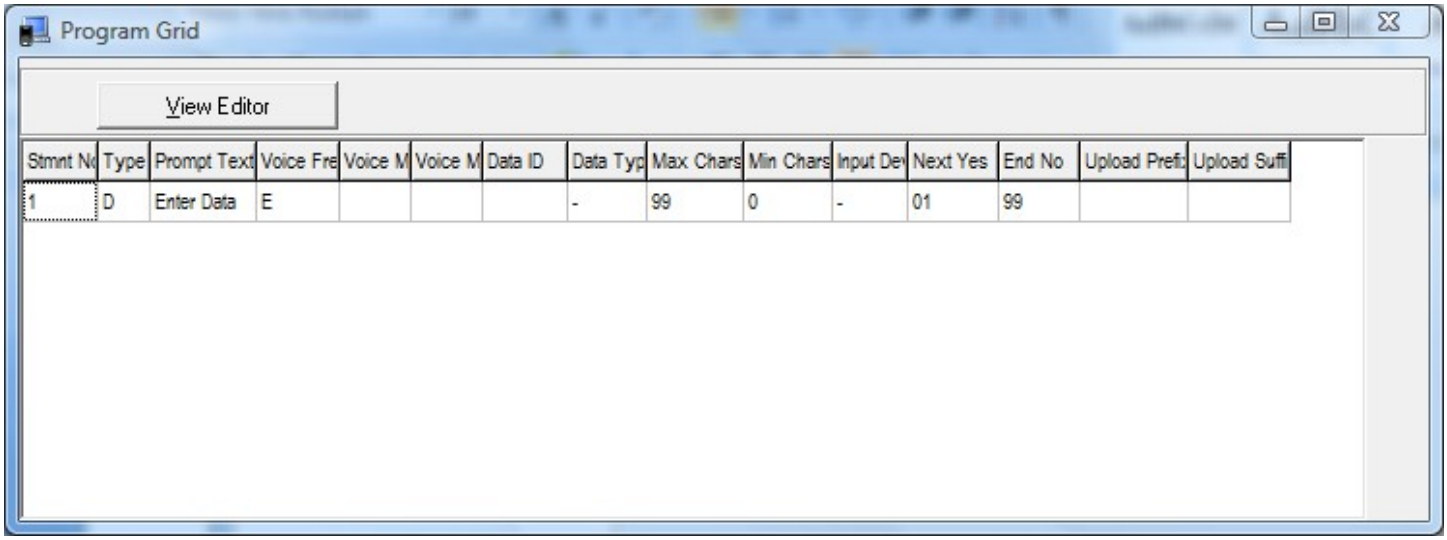
1. Click on **Start**, then **Programs**
2. Choose the **Hardware Utilities** folder (or the folder name you specified during the installation), then click on the **Hardware Utilities** Icon
3. Select the **7802 WiFi Terminal** Tab on the left of the Screen

4. Select Batch Program Editor on the **7802 WiFi Terminal** Menu



5. Press the **Start Program Editor** button and follow the prompts.
6. You will then see the following screen(s) for the Batch Program Editor:





From this screen you can create a new Terminal Batch Program. By default the **View Table** (Program Grid) is activated and will also appear with the **Program Editor** screen. For help getting started simply press the **Help** button and you can get detailed instructions on how to use the **Program Editor**.

Statement Types Reference

Use the Batch Program Editor described in the previous section to create and edit Batch Mode program files for your 7802 WiFi Terminals.

The Batch Program Editor's help file contains detailed information on how to create a program file. What is included here is even more detailed information on the underlying structure of the program elements.

These are the *Statement types* available:

Statement Type	Statement Code
Data	D
Branch	B
Question	Q
Stamp (Date and Time Stamp)	S
Time (Time Stamp only)	T
Date (Date Stamp only)	Y
Xtra	X
None	N
~~Data AND Immediate Output~~	(not supporting in 7802 Terminal)
Compare	C
Print (Printer Output)	P
Arithmetic	A
~~Copy Table Data To Prompt~~	(not supporting in 7802 Terminal)
Transmit Data (to Host)	x

Statement Details Reference

Data

Data entry prompts are program statements that prompt the operator to enter data for storage in memory. A typical *Data Statement* would be prompting the operator for an “Item Number” or a “Quantity”. This is the most commonly used statement type.

Branch

A *branch statement* allows the program to jump to anywhere between 1 and 15 different statements depending on the character entered at the branch prompt. The data entered at a *branch statement* is not saved to memory, it simply acts as a pointer, directing the program to the appropriate statement.

Question

A *question statement* creates a program prompt that the user answers YES or NO to. Data is not stored to memory for this type of statement; a YES answer directs the program to one statement number while a NO answer directs the program to another statement number. The question statement is answered by pressing the YES or NO key on the Terminal keypad.

Stamp (date and time Stamp)

The *Date and Time Stamp* statement requires no action from the user. By specifying **S** as the statement ENTRY TYPE, the Terminal accesses its internal real-time clock and writes the current date and time information to memory when the program statement is executed. By default, this information is not displayed by the Terminal when the statement is executed, but it can be displayed simply by entering DIS in the DATA ID field of the program statement.

The default format of the date and time stamp is

MMDDYYHHMM *(if USA)*

The format can be changed using the *Date& Time Formats* setup parameter.
If you want to add seconds to the time portion of the *Date and Time stamp*, use **s** instead of **S**.

The *Date and Time Stamp* statement uses only 3 programming statement fields; ENTRY TYPE, DATA ID and YES/NEXT STMT.

Time (time stamp)

The *Time Stamp* statement type records only the time information to memory in the **HHMM** format. Just as with the *Date and Time Stamp* statement, using DIS in the DATA ID field will display the time information on the Terminal screen when the statement is executed. Use **t** instead of **T** to record seconds in addition to the hours and minutes.

The *Time Stamp* statement uses the same program fields as the *Date* and *Time Stamp* statement.

Date (date stamp)

The *Date Stamp* statement stores only the date information in a **MMDDYY** format. As in the other Date/Time stamp statements, using DIS in the DATA ID field will display the Date information on the Terminal when the statement is executed. The date format can be changed using the Alternative Date Format settings in the Terminal setup.

The *Date Stamp* statement uses the same program fields as the other *Date* and *Time Stamp* statements.

Xtra

The *Xtra Statement* works with the "**ENTER QUANTITY**" prompt by automatically entering a quantity of "**1**" if the user enters another *Item number* instead of a quantity. The user has the option of entering an actual quantity if it is more than "1". The **XTRA Statement** must be set **before** you begin your data collection. To use the **XTRA Statement**, three things must happen:

- The *statement type* for the "**ENTER QUANTITY**" prompt must be "**X"** (Xtra).
- The ***maximum data length*** of the "**ENTER QUANTITY**" statement must be *less* than the ***minimum data length*** for the *next* statement to be executed.
- The length of the data entered at the "**ENTER QUANTITY**" prompt must be *between* the ***minimum data length*** and the ***maximum data length*** of the *next* statement to be executed.

Program Example:

If the number of characters entered at the "**ENTER QUANTITY"** prompt is less than the ***minimum data length*** of the "**ENTER ITEM NO**." prompt, then the data entered is stored as the quantity.

If the number of characters entered at the "**ENTER QUANTITY**" prompt is between the ***maximum data length*** and the ***minimum data length*** for the "**ENTER ITEM NO.**" prompt, then a "**1**" is stored as the data for the "**ENTER QUANTITY**" and the data entered at the "**ENTER QUANTITY**" prompt is stored as the data for the "**ENTER ITEM NO.**" prompt. If it seems confusing, use the following *Terminal Coding Form* as an example:

Stmt #	Entry Type	Prompt	Min Data Len	Max Data Len	Next Stmt
01	D	**ENTER ITEM NO.**	06	13	02
02	X	**ENTER QUANTITY**	01	04	01

While collecting data using the program shown above, if data between 6 and 12 digits in length is scanned or entered at the "**ENTER QUANTITY**" prompt, data of "**1**" is automatically entered. In other words, **if you continually scan your item numbers** (as long as they are all between 6 and 12 digits in length) **you will**

automatically enter a quantity of 1 for each item. To enter a quantity other than 1, simply enter the quantity by using the keypad, making sure the length of the quantity data does not exceed the ***maximum data length*** for the quantity field (4 digits). The very last quantity entered at the end of data collection must be keyed in from the Terminal keypad, even if it is 1. Also, in order to either scan an item or enter a quantity at this statement, you must change the "Input Type" statement to be blank instead of K or W.

If you are using the "**selective bar code trimming**" feature with the XTRA Statement, the trimming must be specified in both the "DATA Statement" and the "XTRA Statement". For example, if you wanted to eliminate the leading character on all UPC codes, you would have to specify:

{c1

in both the upload prefix for the DATA Statement (Statement 1 on the example above) and the upload prefix for the XTRA Statement (Statement 2 on the example above). If you do not specify the trimming in both upload prefixes, the trimming will not happen correctly.

None

The *None statement* entry type is used as a "dummy" statement, recording no data and transmitting only the *Upload prefix* and *suffix*. It is typically used as a destination for a *branch statement*, allowing you to record what action the operator took without recording any data. The program goes on without any input from the operator.

To illustrate it's use, lets say that a *branch statement* (statement #3) goes to statement #04 *(None statement*) if the operator enters the letter A.

Even though the operator enters the letter A at statement #3, the A will not be written to memory and uploaded because *branch statements* record no data. What if your application requires the A as part of its data? By making statement #04 a *None statement* and entering an A as the *upload prefix* or *suffix*, an A will upload as the data for statement #04.

The None statement can also be used to add more than 15 characters to an upload prefix or upload suffix when using refer-backs – many times 15 characters is not enough. See Upload Prefix in this chapter for more information on refer-back (appending data to another field) programming.

Compare

The ***Compare*** statement will compare the data collected in that statement against data collected in a previous statement and take you to a new statement dependent upon whether the data in the two compared statements matched. The statement to compare to is referenced in the Data ID field. For example, you could enter data in statement 1, then in statement 2, enter new data. then compare that data to the data in statement 1. If the data matches, you could move on to statement 3; if it doesn't match, you could have it take you back to statement 1. An example of an application might be a pharmacy - where you would want to verify that the correct drug is being dispensed into the correct customer vial. Coding for this statement might look like this:

Stmnt #	Type	Prompt	Freq.	Voice Msg.	Data ID	Min. Len	Max Len.	Yes/Next	No/End
1	D	Scan 1st Item	A	41				02	09
2	C	Scan 2nd Item	A	42	01			01	03
3	D	Not Equal, Press Enter	A	62		00	01	01	00

According to the example, data scanned in statement 2 is compared to the data scanned in statement 1. If the two items match, the operator is taken back to statement 1 to scan the next item. If the items do ***not*** match, the operator is taken to statement 3, where an voice error message is played and the operator is instructed to press the ENTER key. Upon pressing the ENTER key, the operator is taken back to statement 1 and it starts over.

Even if compared data is wrong, it is still written to the data file for upload, so an audit trail is available to see where errors occurred.

Print (printer output)

The Terminal supports output to the Zebra QLxxx or Cameo portable label printers using the ***P***. Using the LabelVista* software included with the Zebra printer, design a label format, identify the fixed and variable fields and download it to the QLxxx or Cameo printer via USB using the Hardware Utilities program. The printer is capable of holding several different label file formats, each one identified by filename.

The ***P*** statement is then used to:

- Reference by filename the label format file in the printer, and
- Provide data for the variable fields designated in the label format file. The ***P*** statement is limited to **70** characters and refer-backs (*see page 4-11*) can be used.

The ***P*** statement for a label using the filename "*myfile*" with 3 variable fields would look as follows (the *(space)* indicates an actual space character):

!*(space)***UF***(space)***myfile.fmtCRLF*data1*CRLF*data2*CRLF*data3*

CR and LF are scanned from the Full ASCII Menu and the filename must end with ".fmt". No CR/LF is required after the last data item. The Terminal will do it for you. Here is a program example using refer-backs:

Stmnt #	Type	Prompt	Min. Len.	Max Len.	Yes/Next	No/End
1	D	Scan Item Number	1	10	02	09
2	D	Scan price	1	10	03	99
3	D	Scan location	1	10	04	99
4	P	! UF myfile.fmtCRLR}1CRLF}2CRLF}3			01	99

***** For details on creating label formats and specific commands for the printer, see the Zebra CD that comes with your printer. If you do not have a label format, you can utilize line printing by leaving out the **! UF myfile.fmt** portion of the command.

Arithmetic

The Terminal has the ability to act as a simple calculator, performing addition, subtraction and multiplication (no division). The "***A***" statement allows the user to input data (numeric only), press +(add), **-** (subtract) or *****(multiply) and then input another piece of data (again, numeric only). The sum is displayed and the user has two choices; press +, - or * again and enter another number and get a new sum, or press the ENTER key to accept the sum as the final result. Here is an example of data entry for someone who is adding 2 numbers, subtracting a number and accepting a final result:

Terminal Display	User Action
ENTER QUANTITY (program prompt)	press 5 + 8, then press ENTER
13 (intermediate sum)	press - 4, then press ENTER
9 (final sum)	if accepting result as final, press ENTER

There are several restrictions when using the "A" statement:

- You cannot have a "negative" result - in other words, you cannot enter 100 - 115 (expected sum would be -15).
- You cannot start an entry with a "negative number" - i.e. you cannot enter -100.
- You can use whole numbers only - no decimals or fractions.
- Only 1 calculation is allowed per sum; for example, you can enter 10 + 5 and press ENTER, but you cannot type 10 + 5 + 3 for one entry. You would have to enter 10 + 5, press ENTER (sum displayed would be 15), and then type + 3, then ENTER (sum displayed would be 18).
- The maximum sum (intermediate or final) is 65,000.

Transmit Data

Instructs the Terminal to attempt to send all saved data to the host and then execute the next statement. No prompt is generated.

If there is no connection available or the connection fails for any reason, the Terminal will continue in Batch Mode running your program. If data is successfully sent to the host, the host will respond in one of these ways:

- With new prompt data (which will cause the Terminal to switch to Real-Time Mode)
- With a Batch Acknowledge command (Terminal continues running existing Batch Program)
- With a new Batch Program File (Terminal continues running new Batch Program)

See the ActiveX Programming section above on: **SendBatchProgram** and **SendBatchDataACK**

Statement Field Details

Prompt Text

If you have chosen D (Data) for the STATEMENT ENTRY TYPE, typical PROMPT text might be something like "ENTER DATA" or "SCAN BARCODE". A "Q" (Question) statement might display text such as "DAMAGED GOODS?"

The PROMPT Text statement has other uses besides just displaying an operator prompt. By using an @ as the first character in the statement text, you can display the last data entered for this prompt as the default data. To accept this displayed data as the data you want to enter for the prompt, press the ENTER key. For example, if the PROMPT text is "@ENTER ITEM NO.", and the data entered for the prompt is 1234, then the next time the PROMPT text is displayed, it would display as follows:

```
ENTER ITEM NO.
1234 _
```

To accept 1234 as the actual data (instead of entering new data), simply press the ENTER key on the Terminal.

Entering **!** as the first character for the PROMPT text field will cause the Terminal to increment the last data entered for the statement by 1. To accept this data, the user simply presses the ENTER key on the Terminal. To enter different data, press CLEAR, then enter the new data via the scanner or the Terminal keypad.

Lets say that while collecting data in our program, we enter the number 12345 at the ENTER ITEM NO. Prompt when it is displayed on the Terminal. By using the ! as shown above, the next time we see the ENTER ITEM NO. Prompt, the Terminal will increment the last data entered and display it as the input data:

```
ENTER ITEM NO.
1236 _
```

To accept the data, press ENTER. To enter different data press CLEAR, then the new data.

Voice Message Frequency

The next programming field is the FREQUENCY field. This field determines how often the voice messages for this statement are played.

There are two choices for the FREQUENCY field:

1. **E -- E**xception - the voice message is played the first five times that the prompt for this statement is displayed. If the Frequency field is left blank, E is the default.
2. **A -- A**lways - the voice message is played every time the prompt for this statement is displayed.

Voice message prompts can be turned off while in data collection using the following key sequences:

- **Shift – F1 - P**

For total silence, including prompts and error messages, use this key sequence:

- **Shift – F1 - S**

Voice Message Numbers

Up to 2 voice messages can be specified for each statement.

Each voice message is identified using a 2-digit number. If two messages are specified, the first message is played, followed immediately by the second message.

To play no voice messages, specify **0000**.

For complete details and information on Voice Messages and their uses, see the chapter on **Voice Messaging**.

Data ID

The DATA ID field has five different functions:

- **Data Identifiers**
- **UPC/EAN Check Digit verification**
- **Display Date/Time**
- **Prevent Duplicate Entry**
- **Compare Data**

1. Data Identifiers

The first function of the DATA ID field is to specify *Data Identifiers* for the data entered for the current statement. *Data Identifiers* are commonly used by the Automotive and Retail industries and are used to make sure the correct type of data is entered. For example, to make sure the Terminal only accepts data for this prompt that starts with 1A1, put 1A1 in the Data ID field:

DATA ID: 1A1

Data Identifiers can be up to 3 characters long and can be position specific. To only accept data where the second character is “S”, put S in the second character position in the Data ID field:

DATA ID: _*S*_ (data is “space” “S” “space”)

In this example, the data in positions 1 and 3 can be anything; but position 2 must be an "**S**".

2. UPC/EAN Check digit verification for keyed-in data

The second function of the Data ID field is to have the Terminal verify the check digit on an UPC or EAN bar code when the data has be entered on the Terminal keypad (not scanned). This scenario happens often when bar codes are damaged or missing and the data has to be entered by hand. To avoid errors when the data is keyed in, the Terminal will calculate a check digit for the data and compare it to the check digit that was keyed in. If the two digits do not match, the Terminal generates the following error message:

INVALID INPUT
HIT ANY KEY_

To use this feature, enter the following characters at the DATA ID prompt:

U10 - Use this to verify UPC 12 or 8 digit entries
E10 - Use this to verify EAN 13 or 8 digit entries
B10 - Use this to check for both UPC and EAN 13, 12 or 8 digit entries.

UPC/EAN 2 and 5 digit supplements are not supported.

3. Display Date and Time

Normally, a date or time stamp statement does not display any data when executed but sometimes you may want the user to see the data being written to the data file. To display the date and or time, use:

DIS

in the DATA ID field.

4. Prevent duplicate entry of data

To prevent the duplication of data entered at a particular statement, use

DUP

in the DATA ID field. During Data Collection, if data is entered at a statement prompt that had been entered previously for the same statement prompt, the user will see the message:

DUPLICATE ACCESS
PRESS ENTER_

Press ENTER to discard the data and repeat the statement prompt. To accept the data and write it to the data file, press the F1 key. The program will then advance to the next statement prompt.

5. Compare Data

The Data ID field is used to compare entered data when the ***Compare*** statement type C is used. Enter the statement number you want to compare the currently entered data to. For example, if you wanted to compare the data you scanned in statement 2 to the data you scanned in statement 1, you would choose the

statement type C for statement 2 and enter **01** for the Data ID.

Data Type

The **DATA TYPE** field determines what kind of data - alphabetic, numeric or both - is accepted for a particular statement. There are five options for the DATA TYPE field:

- **D -- D**igits Only; digits are 0-9
- **N -- N**umeric Only; numeric data is 0-9, SPACE + - / $, .
- **A -- A**lphabetic Only; alphabetic data is A-Z a-z SPACE - , .
- **ENTER** -- Allow input of *all characters*
- **S --** Start the data entry **S**hifted for *all* characters

If the data is alphabetic (A), data entry is started with the cursor shifted to allow for entry from the Terminal keypad.

The DATA TYPE field is intended to work in a manner similar to the DATA ID field - it is meant to minimize operator data entry errors. For example, if the statement prompt text is QUANTITY, and you want only digits entered at this statement, use D in the DATA TYPE field.

Maximum Data Length

This field determines the maximum number of characters allowed for a statement.
The Terminal reserves memory for a data field based on the *Maximum Data Length*. If you specify a maximum data length longer than you know you'll need, you will be able to collect less data due to the extra memory. For example, specifying 10 characters instead of 12 would allow for almost 100 more pieces of 10-character data.

Maximum Data Length can be between 01 and 99 and should include Data Identifiers if your data uses them.

The **DATE LENGTH MAX** is important when using the Xtra Statement. See the section on the XTRA STATEMENT for more information.

Minimum Data Length

This field tells the Terminal the fewest number of characters to accept for a particular program statement. Specifying a *Minimum Data Length* can reduce data entry errors and is particularly important when using an Xtra Statement. The *Minimum Data Length* should take into consideration Data Identifiers if your data uses them.

The minimum data length can be anywhere from 00 to 99. 00 would be used if you wanted the user to be

able to simply press the **ENTER** key without actually entering any data for the statement.

Input Device

This field tells the Terminal where the data will be coming from. There are 3 valid entries for this field:

- **K --** Terminal **keypad** entry only
- **W -- Scanner** input only. This includes any bar code scanner attached to, or built into the Terminal.
- **R -- Serial device** input. Use for scales or other serial interface instruments. Data must be terminated by carriage return (CR). Upload prefix /suffix and max/min data length are not supported.

Leaving **INPUT DEVICE** blank allows for both keypad and/or scanner input.

Yes/Next Statement

This field allows you to tell the Terminal which statement to go to next or, in the case of a Question statement, where to go if the question is answered by the YES key.

Make sure the statement number you specify is a valid statement. If your program is a simple one statement program (assuming it is statement #01), you would specify statement #01 as the **YES/NEXT STMT**.

No/End Statement

This field determines where the program goes if the **END** key is pressed, or in the case of a question statement, where the program goes if the **NO** key is pressed.

For a question statement, this field simply tells the Terminal where to go next when the question is answered with NO. In the instance of the **END** key, what can happen next can vary.

Pressing the **END** key can have a different effect; depending on what statement you go to next:

- Go to any valid statement by specifying that statement number in the NO/END STMT field. Besides simply going to another statement, this allows you to use the **END** key to break out of complex data collection loops. For example, say you have a program that prompts for (1)BLDG., then (2)AISLE, then (3)ITEM, then (4)QUANTITY, with a loop that goes back to ITEM after QUANTITY. To break out of the loop at ITEM and go back to BLDG, use 01 in the NO/END STMT for ITEM. To break out of the loop at QUANTITY and go to AISLE, use 02 in the NO/END STMT for QUANTITY.
- If you want to exit data collection when the **END** key is pressed, specify 99 in the NO/END STMT field.
- If you want to disable the **END** key (have it do nothing), specify statement #00 in the NO/END STMT field.

Upload Prefix

The **PREFIX** field allows you to specify a unique 1-15 character string to be uploaded BEFORE the data for this statement, every time the statement is executed. The Upload Prefix is an extremely useful tool, as it has more uses than simply adding characters to a field of data. Here are the five functions of the ***Prefix***

field:

1. **Data field identification**
2. **Timing Delays**
3. **Appending data to another field**
4. **Trimming data from the front of a field**
5. **Padding data with spaces or zeros at the front of a field**

1. Data Field Identification

By specifying particular characters in the Upload Prefix, you can help the host computer program identify or distinguish one field of data from another. For example, if your software identifies part numbers by seeing the letter P before each part number, specify P in the Upload Prefix. Think of it as a way to add Data Identifiers when they aren't already part of your bar code.

2. Timing Delays for this field only

Timing delays of .10 seconds to 9.9 seconds can be programmed into the *Upload Prefix* (and *Suffix*). This feature is not suitable for use with the 7802 WiFi Terminal.

3. Appending data to another field

A very common use of the *Upload Prefix* (or ***Suffix***) is to append data to a field every time that field is uploaded. Use the characters:

}xx

where **xx** is the number of the statement you want to attach. To save space (you are allowed only 15 characters in a prefix or suffix), a single digit can be used when the statement number is a single digit - }2 is the same as }02 - as long as it is not followed by another valid digit.

As an example, let's say you wanted to attach an aisle number as a prefix to every item number you entered. Assuming the aisle number is statement #02, entering }02 in the Upload Prefix of the item number statement would attach the aisle number to every item number. Only the data in statement #02 would be attached; any *Upload Prefix* or *Upload Suffix* characters for statement #02 will not be uploaded.
The field that is appended (#02 in our example) is typically not uploaded by itself - it is only uploaded in conjunction with another field. To suppress the transmission of a field entirely upon uploading, use:

~0

in the *Upload Prefix* or *Upload Suffix* (either will work) for that field.

The example above would upload the data in statement #01 attached in front of the data for statement #03 every time it is uploaded.

4. Trimming data from a field

The *Upload Prefix* can be used to trim 1-15 leading characters from the specified statements data. Trimming can happen in 3 ways:

~x

where x is a single hex digit corresponding to the number of characters you want to remove from the data. Valid entries are 1 - F (corresponding to 1-15). Trimming characters using the ~ waits to trim the data until it

is uploaded.

{x

where x is a single hex digit corresponding to the number of characters you want to remove from the data. As above, valid entries are 1-F. Trimming characters using the { character trims the data BEFORE displaying it on the Terminal screen and before checking data lengths and data ID's.

{zx

where ***z*** is the bar code ID character and ***x*** is a single hex digit corresponding to the number of characters you want to remove from the data. As above, valid entries are 1-F. This type of trimming is called "selective" trimming. It only trims characters from the specified bar code type if it is scanned. See chapter on *Setup - Code 128 Parameters* for the correct bar code ID characters for each bar code type.

5. Padding data with zeros or spaces

The *Upload Prefix* can be used to add zeros or spaces before the data up to the *Maximum Data Length* specified for the statement. Padding and Trimming are mutually exclusive; trimming always takes precedence. To pad data with zeros, use:

^0

To pad data with spaces, use:

^S

Upload Suffix

The **SUFFIX** is just like the *Prefix*; only it is appended ***AFTER*** the data for the statement.

For details see the previous section on *Upload Prefixes*.

By default, **Suffix** data is transmitted AFTER the data but BEFORE the *Terminator Character*. The default transmission format when using *Prefixes* and *Suffixes* is as follows:

(ID)(Prefix) DATA (Checksum Chs)(Suffix) (Terminator Ch)

To transmit the **Suffix** after the Terminator, change the ***Terminator Character*** to **OFF** (the default is ON).

Chapter 7: Portable Printers

Cameo and QL 3 Common Information

Both of these printers are stocked by Worth Data for the convenience of our users who need portable printing.

These printers do **not** require any special protocol; they do not require the "wake-up byte" as do other printers. They do require a special cable that can be ordered from Worth Data (part #C13); cable pin-outs are available in **Appendix C**: ***Cable Pin-outs***.

Shipped with every Cameo or QL 3 printer ordered is a CD ROM with the Programmers Manual in PDF format and a label design program – ***LabelVista***. This program allows you to design the program and create multiple format files that can be sent to the printer where they become resident in flash. Variable fields are defined and can then be filled in by the program when in operation.

Keep in mind the following information when using these versatile printers:

- The printer turn on ("Wake-up") is accomplished by the RF Terminal toggling the DSR line on the printer, so only the @S command and the data you are sending to the printer is needed.
- Once the RF Terminal has turned on the printer, it stays on until the host program turns it off using the POWER OFF COMMAND "ESC(0x1b)`p'(0x70)" described in the **Printing Systems Programming Manual**, or until the automatic shut-down takes place (2 minute default).
- The 231 character limit applies to your command string. See your **Portable Printing Systems Programming Manual** for details on programming your printer.

Zebra Cameo Printer

The Zebra "Cameo" Printers are portable direct thermal receipt printers, (**not** label printers – the QL 3 below prints labels). Bar codes can be printed on the receipts, but you can't print labels.

One model of the Cameo printer is available with a magnetic stripe reader, allowing magnetic stripe input to the RF Terminal using the @M (magstripe input) command.

The Cameo printer with magstripe input is capable of reading Track 1, Track 2 or Tracks 1&2. See your **Portable Printing Systems Programming Manual** for the correct character string to send in the @M command to turn on the magstripe reader. (see page 6-2 for details).

When the Terminal sends data to the host, it sends it in the following format:

RF Terminal ID + *DATA* + CR

Typically, the data is simply a string of characters, but in the instance of data coming from the magstripe reader, there are some additional characters you need to be aware of. The magstripe reader sends its data in the following formats:

Track 1: *T1: DATA*
Track 2: *T2: DATA*

Track 1&2: *T1: DATAT2: DATA*

So, when the RF Terminal transmits the data to the host, it will be in the following format:

RF Terminal ID + *T1: DATA* **+ CR**
or
RF Terminal ID + *T2: DATA* **+ CR**
or
RF Terminal ID + *T1: DATA* **+** *T2: DATA* **+ CR**

For further information, see your **Printing Systems Programming Manual** on the CD ROM shipped with the printer.

Zebra QL 3 Printer

The QL 3 Printer is used for label printing. It doesn't have Magstripe input. The classic application is for printing shelf labels during shelf price verification:

- The operator scans a shelf label.
- The Terminal transmits scanned data to the host computer.
- The host computer looks up the price, description, etc. and transmits the computer price back and sends the necessary commands to the attached QL 3 printer to prints a new shelf label with the correct price.
- The terminal operator then peels off the label and applies it to the shelf.

Each printer is shipped with a no charge roll of thermal paper that can be used for development, including determining the exact label size that best fits you needs and the capabilities of the printer.

We stock the 2" and 3" QL 3 printers with several label sizes immediately available including:

Part Number	Description	Price/Roll
E2L1	2"x1" Vinyl Shelf Adhesive Labels	$3.50
E2L2	2"x1.25" Paper Permanent Adhesive Labels	$2.50
E2L3	2"x2" Paper Permanent Adhesive Labels	$2.50
E2L4	2"x1.25" Vinyl Shelf Adhesive Labels	$3.00
E3L1	3"x1" Vinyl Shelf Adhesive Labels	$7.50
E3L2	3"x1.75" Paper Permanent Adhesive Labels	$5.00

Shelf adhesive labels are designed for ease of removal to facilitate replacement. Permanent adhesive labels are designed to stick and stay stuck, making removal difficult without leaving a residue.

Chapter 8: Voice Message Operations

The Wi-Fi RF Terminal's exclusive use of voice prompts allows you to overcome problems such as literacy, language and lighting. With proper planning, voice prompting can enhance your Wi-Fi RF Terminal application, making it faster and simpler. Voice messages are recorded (or imported from existing sound files) and uploaded to the Wi-Fi RF Terminal using the Worth Data Hardware Utilities program included on the Utility CD. Playback of a voice prompt is triggered by a prompt from the host computer.

Why Use Voice Messages and Prompts?

- Voice messages can be in ***any*** language.
- The operator does not have to be able to read to perform some jobs.
- Voice Prompts can be very helpful in dimly-lit or extremely-cold environments.
- The data collection process is faster because the operator does not have to continually look at the screen for instructions. This is especially useful when you do not want or need to enter data from the keypad. Scanning bar coded numbers from a Quantity BARPAD can make keying unnecessary.
- Voice messages and prompts are a good way to keep the operator's attention focused on the job at hand. Audible error messages and warnings also help to limit mistakes and downtime.

Voice Prompts and the Worth Data Hardware Utilities program

The Worth Data Hardware Utilities (which can be installed from the Utilities CD) makes it easy to manage your Wi-Fi RF Terminal system's Voice Prompts:

- Record custom Wi-Fi RF Terminal voice prompts using your computer's built-in or external microphone.
- Import custom Wi-Fi RF Terminal voice prompts from existing sound files.
- Edit Wi-Fi RF Terminal Voice Prompts to trim off any extra seconds of silence or noise before or after the actual words of the Voice Prompts.
- Delete unwanted Wi-Fi RF Terminal Voice Prompts.
- Rename Wi-Fi RF Terminal Voice Prompts to correct or update the descriptions you had entered for them.
- Renumber Wi-Fi RF Terminal Voice Prompts to change the Voice Prompt numbers assigned to them.
- Restore Default Wi-Fi RF Terminal Voice Prompts you had replaced or edited.
- Send Voice Prompts to one or more Wi-Fi Terminals.

See the Worth Data Hardware Utilities program help file for complete instructions on using the Hardware Utilities program.

Tips for Using Voice Prompts

Up to 99 voice messages can be recorded and stored in the Wi-Fi RF Terminal. Here are some tips on

making your voice prompts user-friendly:

1. **Short messages** are preferable for prompts; most English prompts can be stated in ½ second. Instead of saying, “Enter the Item Number,” say “Item”. The typical Wi-Fi RF Terminal operator does not want to hear long messages thousands of times. Error messages are typically longer because they are the exception and need to provide more precise instruction to the user.
2. **Record your voice prompts calmly**. A frantic sounding voice can become irritating, especially when heard repeatedly.
3. **Speak clearly**. Correct pronunciation will make the voice prompts easier to follow for all users. Use common words that all users will understand.
4. **Vary the tone of your voice for different prompts**. Using a different tone of voice or even a different voice for consecutive prompts or error messages will make it easier for the user to distinguish between them.
5. **Don't be discouraged** if your first attempts at recording Voice Prompts don't sound very good. Again, practice speaking clearly and calmly, and you'll soon get the hang of it.
6. **Be sure to record error messages for *all* possible problems** that the user may encounter during a session. Once the operator becomes accustomed to listening to the voice prompts, it may become easy to overlook a “display only” error message.

Assigning Error Messages

The Wi-Fi RF Terminal comes from the factory with some voice prompts and error messages pre-recorded. You can change any of these messages but keep in mind that the error conditions are hardware-related and that the voice error messages they are linked to are fixed. For example, the “**Low Batteries**” message is located at message #98. Whenever the RF Terminal detects very low batteries, it will play message #98, regardless of what is recorded there. You could record “Happy Birthday” and the Wi-Fi RF Terminal would broadcast it any time it detected the low battery condition. To avoid confusion, try to keep the error messages somewhat related to the error condition they represent.

Default Voice Messages

Here are the default messages and the numbers they are recorded under:

Message Recorded	Message #
Prompt	
ITEM	#01
QUANTITY	#02
Error messages	
LOW BATTERIES	#98
TRANSMISSION FAILED	#99

Chapter 9: Troubleshooting

General Considerations

Changing the Battery

For RF Terminals, the most frequent cause of problems is a low battery that has either been ignored or undetected. The real test for the battery is to remove battery from a working unit and place it into a suspect unit.

Most of the time the battery becomes the problem as a result of:

- The operator ignores the **Low Batteries** message and doesn't finish up the transaction and immediately charge the battery. If you turn the unit off and turn it on again, the battery may have had time to "almost" recover. Unfortunately they will have so little reserve power that they will likely operate just long enough to produce very inconsistent behavior on the RF Terminal. Intermittent laser beams, continuous beeping, a blank screen, etc. are just a few of thesymptoms that can be exhibited.

Problems with a new installation:

"**Searching Host Application**" is a normal message, generated when you first try to establish radio contact. If your Terminal continues to generate this message and it ultimately results in a "**Host Application Timed Out"** message, your Terminal is not making a connection with the network. Make sure your Access Point and Connection Host configuration is correct and try again. Make sure there is a properly configured Application Server running. If you have multiple terminals, try another terminal. If the 2nd terminal also fails, then it is likely there is something wrong with the configuration.

If the Terminal displays the "**Waiting on Host Prompt**" message, the Application Host program is not communicating with the Connection Host. There is no radio problem, because the Connection Host has already acknowledged the Terminal's Sign In. The Terminal is waiting on the Host to tell it to do something. Try Worth Data's demo Application Server; if it works then the problem is your program.

If the demo Application Server fails, the problem is one of the following:

- Your internet connection is down or busy. The demo Application Server is experiencing high traffic and is busy.

Terminal Error Messages

Message	Meaning – Action Required
"Initializing Radio Unit"	This is a normal message, generated when you first establish radio contact. If you continue to get this message and it results in a "Transmission Failed" message, makes sure your Access Point setup is correct.
"*Waiting on Host Prompt*"	Problem is between Connection Host and Application Server. Check to see if Application Server is running. Check Connection Host setup. Run the default Connection Host and demo Application Server.
"Server Shut Down Due to Host Logic Error, Cycle Terminal Power"	Problem is in host program. Notify programmer! If the Application Server receives 5 **Sequence Errors** in a row, it transmits the message to all terminals signed in and shuts down. Check your host program for the sequence error before starting up again. **OR** If the Application Server receives 5 messages addressed to a Terminal not Signed ON, it transmits this message to the all terminals signed in and shuts down. You will have to restart the Application Server or you can send a command (*@EOT) from the server and have the Terminal Sign On again to continue.
LOW BATTERY Finish, Sign Off Charge Battery	Finish the transaction you have started. The Press F1 to Sign Out. Then turn off the Terminal and charge the battery. This is an early warning that the battery is getting low and should be charged soon.
CHARGE BATTERY UNIT SHUT DOWN	The terminal will display this message for 20 seconds, sign out, and turn off. The unit will not operate until the battery is charged.
Transmission Failed To Retry, Move Closer And Press Enter	The terminal has tried 10 times to get its message through to the Host with no success. Could be result of bad radio in AP or terminal. Could be the operator has gone out of range of the AP - if so, move closer and press any key. Could also be that there are too many terminals competing for radio time on one AP.
No Firmware Detected ***1 – Download Firmware*** ***0 – Power off Terminal*** ***Press 0 or 1 now_***	The firmware has somehow been wiped out – probably from an interrupted firmware download. Press 1 to Download Firmware or press 0 to power off the terminal.

Troubleshooting specific problems

I can't communicate at all...

- First, check the settings for SSID and Wi-Fi Security on your AP and make sure they match the same settings on the Wi-Fi RF Terminal.
- Make sure the SSID and Passkey or WEP Key match exactly with the same upper and lower-case characters for the SSID.
- Double check the server IP and port address.
- Verify that the Connection Host and Application Server are running.
- If DHCP fails, make sure you have a DHCP server on your system and that it is running.
- Try another Wi-Fi security type to see if that works better. Most APs support several types of security.
- Try scanning for APs with another Wi-Fi device and see if they show up. Verify that the SSID and Security Type is what you expect.

My response time is poor...

- You may have too much overlapping AP coverage. If you have more than one AP set the channel for the first AP to 1 and the next AP to 6 and the next AP to 11 then repeat 1,6,11,1,6,11,etc. This prevents RF overlap.
- You may be getting interference from other APs. Try changing the channel on your AP to a different channel.
- You may need another AP. If you are operating at the fringe of the reception range then the response could be poor. If you get quick response when close to the AP and slow response farther away then you probably need another AP. Make sure to select a different channel for the other AP(s) (see note above).

I'm not getting the distance I need...

To maximize range, AP(s) should be located:

- At the center of the area of intended coverage, and
- As high as possible - mounted on the ceiling of a room with the antenna pointing downward works the best. Sometimes just raising the AP 1 to 2 feet will dramatically increase the distance, especially in warehouses or grocery stores with tall shelving. An AP mounted on the wall with the antenna parallel to the floor is the worst position.
- In an unobstructed outdoor area, a range of 1000 feet or greater "line-of-sight" is possible but indoor "obstructed" range will be much less. Reflections and obstructions, depending on the density and material, can reduce the range to a hundred feet or less.
- To accurately determine the hardware required to cover a particular area, you should use the Site Survey mode built into the Wi-Fi RF Terminal.

Wi-Fi RF Terminal Problems

When laser is triggered, it cycles power by itself – 1st screen
When a voice message plays, it cycles power by itself –1st screen
When I turn it on, it just beeps continually.
When I turn it on, the screen flashes continually.

- If the battery is very low, when turned on, the Terminal will just keep beeping; it is cycling power, over and over because the batteries are too low.
- If the batteries are at a specific low point, the laser triggering or playing a voice message will be just enough extra power draw to force the terminal to cycle power.
- Charge your Terminal for at least an hour and try again.

I get 6 beeps when the Wi-Fi RF Terminal powers up...

- The unit needs repair. Call Worth Data for an RMA.

Problems reading Bar Codes

The reader won't beep when I try to read bar codes...

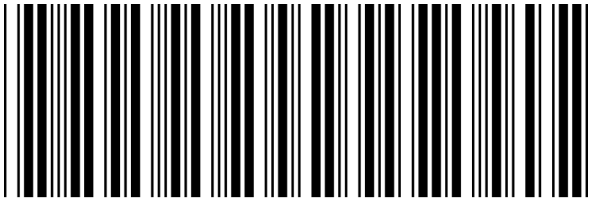
- Try reading a known good bar code - try the **1** on the Setup Menu bar pad table. Follow the steps for proper scanning technique discussed in **Appendix *How to scan a bar code***.
- Make sure the reader is configured to read the type of bar code you are trying to scan. Most bar code types are ***disabled*** by default and need to be enabled using the Setup Menu or keypad while in Setup Mode.

I get extra characters at the beginning or end of my bar code data...

- Clear the Preamble and Postamble settings.

I have very poor read rates when scanning bar codes...

- Carefully follow the scanning instructions in **Appendix *How to scan a bar code*** when reading any and all bar codes. As straightforward as scanning may seem, many people who call with a complaint about poor read rates simply aren't doing it right.
- Try reading the following bar code below as an example of a known “good” bar code. This bar code is a Code 39 bar code and is readable by the RF Terminal set to its default settings.



- Make sure *your* bar codes have clearly defined dark bars and clean white spaces. If the bars are so light that they are gray instead of black or are so dark that they “bleed” into the white spaces, the printing of

the bar codes is the problem. Whoever is printing the bar codes needs to make the necessary corrections.

- The bar code should also have a “quiet zone” of at least ¼” to the left of the first bar and to the right of the last bar. Make sure the beam covers the bar code completely and “overscans” a bit on each end.
- Check the laser beam window at the top of the unit and make sure it's not dirty or scratched.

Problems with Voice Prompts

- If you have any problems with RF Terminal Voice Prompts, read the “If you have problems” topic of the Worth Data Hardware Utility program help file.

If you still have a problem…

- If you have a problem with your RF System, **consult the troubleshooting section of this manual FIRST**. As a last resort before calling for an RMA, you can follow the steps below to perform a diagnostic reset on your terminal. This resets everything back to the factory defaults, so be prepared to remake any setup changes you had made prior to the reset.
- Turn your terminal on, and press any key to bring up the Mode Menu.
- With the terminal displaying the Mode Menu, press the terminal's **2** key to select **Setup**.
- With the terminal displaying the RF Terminal Setup menu, press the terminal's **9** key to select S**ystem Tools**.
- With the terminal displaying the System Tools menu, press the terminal's **3** key to reset all terminal settings to the factory defaults.
- If you cannot find the answer here, or if doing a diagnostic reset does not help, call your Dealer or Worth Data for help.
- **Save the shipping box**. If you ever need to send the RF Terminal or any of its parts back for repair, use this box.
- Before you call your dealer or Worth Data for technical support, have your Wi-Fi RF Terminal and related equipment in front of you and **be prepared to explain your problem in detail to the Technical Support Engineer**.
- The Engineer may ask you to go through some troubleshooting procedures while on the telephone. This will help them determine what is wrong and what the course of action should be. **Many problems can be resolved over the telephone and will not require that you return the equipment to us**. If you *do* need to return any of the RF equipment to Worth Data, the Engineer will issue an RMA number.
- If you do need to return the RF Terminal for ANY reason, **you MUST have an RMA number** first. Write the RMA number on the outside of the original shipping box and make sure to insure the shipment. All RMAs should be shipped back to the following address unless directed otherwise:

RMA #XXXXXX
Worth Data Inc.
623 Swift St.
Santa Cruz, CA 95060
831-458-9938

Appendix: Firmware Upgrades

Updates are occasionally available for the ***Wi-Fi RF Terminal System*** when new features or improvements are added.

Wi-Fi RF Terminal Firmware Upgrades

The RF Terminal firmware can be upgraded by downloading new firmware into the Wi-Fi RF Terminal from your computer.

Normal Firmware Download for a Terminal

The Wi-Fi RF Terminal firmware can also be upgraded by downloading a file with the current firmware into the Wi-Fi RF Terminal's flash EPROM using the Worth Data Hardware Utility program found on the Wi-Fi RF Terminal Utilities CD.
If you have received a CD with the latest firmware or have downloaded the firmware from our website, http://www.barcodehq.com, download the firmware into the Wi-Fi RF Terminal by following the instructions on the screens of the program for a normal Terminal firmware update.

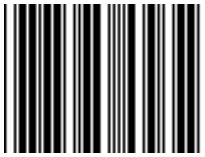
Failsafe Firmware Download for a Terminal

If a terminal's firmware gets completely wiped out (the terminal's battery or power adapter are tested to be good, but the screen stays blank screen or only displays a cursor when you press the power button) you will need to do a “Failsafe firmware upgrade” to restore the firmware.

To do a Failsafe firmware upgrade on a terminal that has had its firmware completely wiped out, run the Worth Data Hardware Utility program (it can be installed from the Wi-Fi RF Terminal Utilities CD), select the “Failsafe” option, and follow the program's instructions as it walks you through the steps to perform a Failsafe firmware upgrade.

Appendix: Code 39 Specifications

Code 39 (or Code 3 of 9) is the de facto standard of non-retail American industry. It is widely used in the automotive industry (AIAG specifications) as well as in government and military applications (LOGMARS specifications). Code 39 is flexible, features a large character set, variable data length and density, and bi-directional readability. Code 39 is extremely accurate; substitution errors are almost nonexistent. Its character set consists of numbers **0** through **9**, upper case **A-Z**, and characters ***Space***, **$**, **%**. / + and **-**.



C39

The name "Code 39" comes from both the fact that its character set originally contained 39 characters (it now has 43) and from its structure. Each character is formed of three wide and six narrow elements, made up of five bars and four spaces. Code 39's density can vary from a low of .75 characters per inch (cpi) to a high of 9.4 cpi. There should be a ¼" "***quiet zone***" (white space) to the left and right of the bar code.

Code 39 uses an asterisk (*****) as a start and stop character. This character must precede and follow the data in the bar code. The RF Terminal gives you the option of transmitting or not transmitting these characters when the bar code is read.

Exact specifications for Code 39 and other bar code symbologies can be obtained from ANSI at the address below:

American National Standards Institute
Customer Service
11 West 42nd St.
New York, NY 10036
http://web.ansi.org
document ANSI/AIM BC1-1995

Code 39 has several advanced features and functions that are discussed further in this appendix.

Code 39 Advanced Features and Functions

Mod 43 Check Character

Standard Code 39 can be printed with a "**Mod 43 Check Character**". This Mod 43 check character *cannot* be used with **Full ASCII Code 39**. Assigning a value to each character in the data to be bar coded from the table as follows derives the check character:

Char	value	Char	value	Char	value	Char	value
0	0	B	11	M	22	X	33
1	1	C	12	N	23	Y	34
2	2	D	13	O	24	Z	35
3	3	E	14	P	25	-	36
4	4	F	15	Q	26	.	37
5	5	G	16	R	27	space	38
6	6	H	17	S	28	$	39
7	7	I	18	T	29	/	40
8	8	J	19	U	30	+	41
9	9	K	20	V	31	%	42
A	10	L	21	W	32		

Mod 43 Check character calculation for Code 39

Here is an example to illustrate how the check character is calculated for bar code data of **123XYZ**:

Take the sum of the values assigned to each character:

1 + 2 + 3 + 33 + 34 + 35 = 108

1 2 3 X Y Z

Divide the sum by **43**: (thus the name modulus 43)

108/43 = 2 with a Remainder of 22

Find the character corresponding with the remainder.

M (*value 22) is the CHECK CHARACTER*

The data becomes **123XYZM**, with **M** added as the Mod-43 check character.

Full ASCII Extension to Code 39

"**Full-ASCII Code 39**" expands the Code 39 character set to include all 128 ASCII characters. Symbols 0-9, A-Z and punctuation characters and are identical to their Code 39 representations. Lower-case letters, additional punctuation characters, and control characters are represented by sequences of ***two Code 39*** characters.

This table depicts the Full ASCII character set as a function of Code 39 characters:

ASCII	Code 39	ASCII	Code 39	ASCII	Code 39	ASCII	Code 39
NUL	%U	SP	Space	@	%V	‘	%W
SOH	$A	!	/A	A	A	a	+A
STX	$B	“	/B	B	B	b	+B
ETX	$C	#	/C	C	C	c	+C
EOT	$D	$	/D	D	D	d	+D
ENQ	$E	%	/E	E	E	e	+E
ACK	$F	&	/F	F	F	f	+F
BEL	$G	‘	/G	G	G	g	+G
BS	$H	(	/H	H	H	h	+H
HT	$I	)	/I	I	I	i	+I
LF	$J	*	/J	J	J	j	+J
VT	$K	+	/K	K	K	k	+K
FF	$L	,	/L	L	L	l	+L
CR*	$M	-	- or /M	M	M	m	+M
SO	$N	.	. or /N	N	N	n	+N
SI	$O	/	/O	O	O	o	+O
DLE	$P	0	0 or /P	P	P	p	+P
DC1	$Q	1	1 or /Q	Q	Q	q	+Q
DC2	$R	2	2 or /R	R	R	r	+R
DC3	$S	3	3 or /S	S	S	s	+S
DC4	$T	4	4 or /T	T	T	t	+T
NAK	$U	5	5 or /U	U	U	u	+U
SYN	$V	6	6 or /V	V	V	v	+V
ETB	$W	7	7 or /W	W	W	w	+W
CAN	$X	8	8 or /X	X	X	x	+X
EM	$Y	9	9 or /Y	Y	Y	y	+Y
SUB	$Z	:	/Z	Z	Z	z	+Z
ESC	%A	;	%F	[	%K	{	%P
FS	%B	<	%G	\	%L	|	%Q
GS	%C	=	%H	]	%M	}	%R
RS	%D	>	%I	^	%N	~	%S
US	%E	?	%J	_	%O	DEL	%T, %X

Full ASCII Table

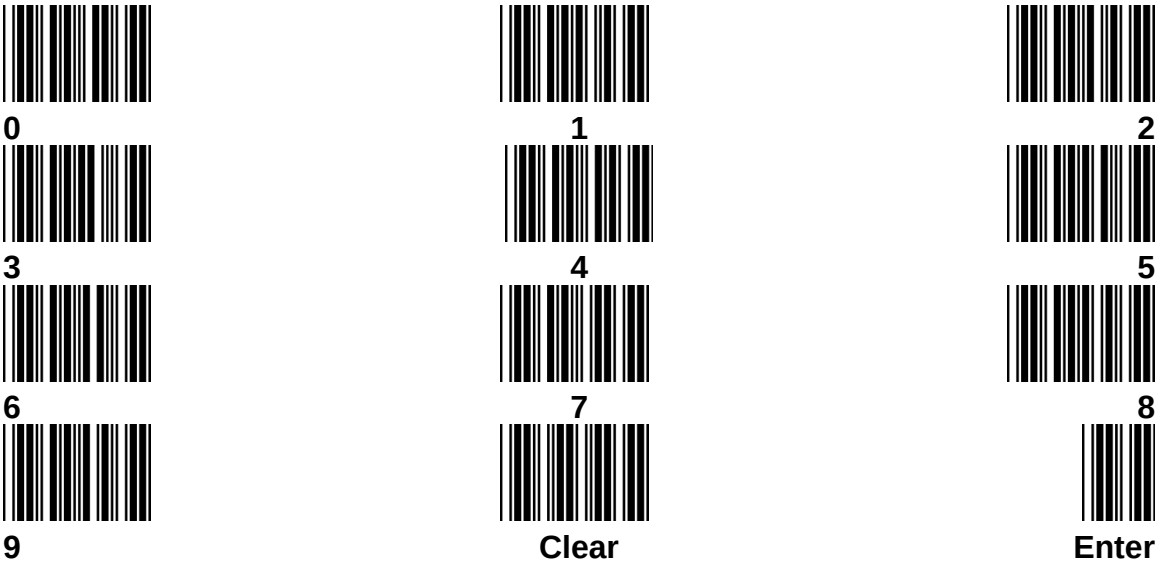
Accumulate Mode

Accumulate Mode is an option allowing the RF Terminal to accumulate multiple bar codes in its buffer, then transmit them to the computer as if they had been a single bar code. This is useful for entering quantities and other variable data.

Accumulate Mode works with Code 39, Code 93 and Code 128 only and can't be used with a check digit. When the RF Terminal reads a bar code with a **space as the first character**, it beeps and buffers the data without transmission. It continues to read and buffer bar codes (up to 40 characters) until it reads a bar code **without a leading space**. Once it reads this last bar code, the entire buffer (including that last code) is transmitted as one long bar code. A "double-minus" sign (--) bar code clears the buffer. The **ENTER** code on this Barpad is a Code 39 *Start/Stop Character* only.

Accumulate Mode must be turned on using the bar coded Setup Menu or by using the keypad. ***Accumulate Mode*** is located in the Code 39 parameters. Choose **4** to *Enable* or **5** to *Disable* this feature.

This numeric Code 39 "Barpad" illustrates ACCUMULATE Mode. Scan **5**, **3**, **8**, and **Enter**. The RF Terminal transmits a single message of "**538**".



Appendix: Code 93 Specifications

Code 93 is variable length, continuous, bi-directional, compact code. Code 93 is an alphanumeric bar code which consists of *43 data characters* (**0-9**,**A-Z**,**$/+%.-** and **Space**), *4 control characters*, and a *unique start/stop character*. The entire set of 128 ASCII characters is represented in Code 93 using combinations of *control characters* and *data characters*.

The control characters are ($), (%), (/), and (+). Pairing these control characters with normal data characters creates full ASCII 93. It is almost identical to the pairings for Code 39; Code 39 uses $M to produce a Carriage Return (ASCII 13) character -- Code 93 uses ($)M to produce the Carriage Return.

Code 93's two built-in check digits greatly minimize the possibility of reader substitution errors. The bar code reader never transmits digits the check digits. Code 93's Start and Stop characters are also never transmitted.

If you have not decided which bar code type to use for your application and are considering using Code 93, while we agree that Code 93 is an excellent code, we believe that Code 128 is generally preferable because:

- Code 93 **does not** have the numeric compression capability that 128 does, and
- Code 93 requires pairings to make all Full ASCII characters while 128 does not.

Appendix: Codabar Specifications

Codabar is widely used in libraries, blood banks, the cotton industry and transportation industries. Its character set consists of numbers **0** through **9**, and punctuation characters **+ . - / :** and **$**. Symbols **a, b, c, d, t, n, *** and **e** are used as start and stop characters. Characters are constructed of four bars and three spaces.

a12345b

Codabar is a numeric-only code, but different combinations of start and stop characters can be used to identify different types of labels. Codabar's variable data length and extremely low error rate make for a versatile bar code.

Codabar start/stop transmission

The Codabar section on the RF Terminal Setup Menu lets you determine whether Codabar start/stop characters are transmitted or not. If you are varying start/stop characters with different types of labels, you'll want to "**Enable Stop/Start character Transmission**". Start/stop character transmission can also be helpful if you want your program to differentiate between data coming from the RF Terminal and data coming from the keyboard. If neither of these situations apply, you'll probably want to disable it.

Appendix: Code 128 Specifications

Code 128 is a very powerful bar code, combining an extensive character set and variable length with compactness and error checking. The character set contains all 128 ASCII characters with each character made up of three bars and three spaces. Each element (bar or space) varies from one to four units in width, totaling 11 units of width per character. Code 128 contains two levels of error checking:

- Each character is checked for internal parity, **and**
- The last character is a checksum.

Code 128 has three subsets, A, B and C. Subset A contains alphanumeric characters and unprintable control characters, subset B contains alphanumeric characters plus printable control characters and subset C contains only numeric characters and uses a 2-character encoding scheme to create a more compact bar code. Code 128 uses an internal Mod 103 check character that is not displayed by the bar code reader. Code 128 bar codes can be made up of only one subset or may be a combination of several.

12345

The Code 39 features of **Accumulate Mode**, **Caps Lock ON** and **Caps lock OFF** also apply to Code 128.

UCC-128/ EAN-128

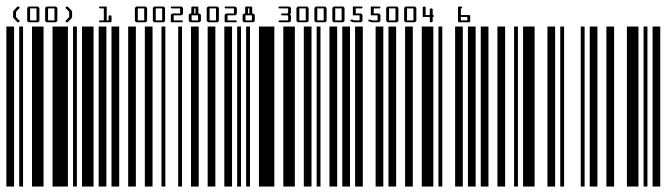
UCC-128/EAN-128 Code is a subset of Code 128 adopted by the UCC and EAN council's for use as a shipping label symbology. UCC/EAN-128 bar codes always start with a Function Code 1 character. In addition, a Function Code 1 character terminates all variable length fields unless they are the last field in the bar code.

The RF Terminal outputs the following for the special function codes and start sequences:

]C1 Start C/Function Code 1
^] (GS) Function Code 1 as a variable string terminator

If **UCC/EAN 128** is ***enabled***, the reader looks for the Start C/Function Code 1 to indicate a UCC/EAN 128 bar code.
The **UCC Serial Shipping Container Code** specification calls for a 19 digit UCC/EAN 128 code with an additional Mod 10 Check digit (20 digits in all). The Mod 10 Check digit is calculated the same as the *Interleaved 2 of 5* example in ***Appendix: Interleaved 2 of 5***. It is the data length as well as the MOD 10 check digit that distinguishes the *UCC* ***Serial Shipping Container Code*** from other UCC /EAN 128 bar codes.

Scanning the appropriate bar codes on the RF Terminal Setup Menu enables **UCC/EAN 128**; or you can use the keypad in the PROGRAMMING MODE "Change Setup" option. If UCC/EAN 128 is ***enabled***, you will be able to read both standard Code 128 bar codes as well as the UCC/EAN 128 bar codes with the *Function 1* character and the Mod 10 check character.



UCC-128 Shipping Container Code

If UCC/EAN-128 is enabled on the RF Terminal reader, all Function 1 codes are transmitted as]C1. In addition, should you be reading a 20 digit Shipping Serial Container code, the Mod 10 check digit is also compared with the computed Mod 10 value to give further assurance of no substitutions. The UCC/EAN-128 Shipping Serial Container Code is a subset of UCC-128 or EAN-128 adopted for voluntary marking of shipping boxes with the exact serial number of the box, (used with EDI typically to identify a specific boxes contents. The code consists of the following format:

Start C	*not transmitted*
Function Code 1	*transmitted*
2 Digit Qualifier	*transmitted*
7 Digit Data Portion	*transmitted*
1 Digit Mod 10 Check Digit*	*transmitted-*
1 Digit Modulus 103	*not transmitted*
Stop Code	*not transmitted*

**Calculated using 19digits-UPC method*

The UCC 128 specification is used extensively by the retail industry. If you have a requirement for a **UCC 128 Serial Shipping Container** bar code, be sure to follow the specification as closely as possible as many vendors will impose fines for non-conformance. For more information on UCC 128, contact the Uniform Code Council at:

Uniform Code Council, Inc.
7887 Washington Village Drive, Suite 300
Dayton, OH 45459
937-435-3870
937-435-7317
info@uc-council.org
8:00 a.m. to 6 p.m. EST

Many of the specifications are available online at:
http://www.uc-council.org

Appendix: Interleaved 2 of 5 Code Specifications

Interleaved 2 of 5 Code is a numeric-only, even-number-of-digits bar code. It is widely used in warehouse and industrial applications. A combination of five elements, two wide and three narrow represent each character. Odd-number position digits are encoded in the bars, even-number positions in the spaces.

Interleaved 2 of 5 Code is so susceptible to partial scans being interpreted as valid reads that we recommend at least one of the following safeguards:

- **Use one length of I 2 of 5 code.** Using one length of data allows you to tell the RF Terminal to look for one length of I 2 of 5 code only. By default, the RF Terminal is set to look for a 6 digit I 2 of 5 code but you can set the length to something different using the RF Terminal Setup Menu. Setting the length to **00** digits allows variable length bar codes scanning. If you must use the **00** setting, we recommend that you then use the "*Minimum/Maximum*" data length field when creating a program in the RF Terminal to check each field for the proper length.
- **Use a check digit.** Worth Data's **LabelRIGHT** printing program automatically calculates and prints a check digit upon request using the method below:

Interleaved 2 of 5 Mod 10 check digit calculation

- Assume that the bar code data is **1987**.
- Starting with the least significant digit (in this case, a 7), label the digits alternatively even and odd.

  7 – even
  8 – odd
  9 – even
  1 – odd
- Take the sum of the odd digits:

  8 + 1 = 9
- Multiply the sum of the even digits by 3:

  (7 + 9) x 3 = 48
- Add the results of steps 3 and 4:

  9 + 48 = 57
- Subtract the result of step 5 from the next highest multiple of 10:

  60 - 57 = 3
- The checksum becomes the low-order digit:

  1987**3**
- Because the data now has an odd length, a leading zero is added, for the final result of

  019873

Appendix: UPC / EAN Specifications

UPC symbols are found on almost all grocery products and many other retail items. The UPC code most people are familiar with (UPC-A) is a fixed-length (12 digits) numeric only code, with the first digit controlled by UPC coding assignments and the last digit a checksum. UPC-E and UPC-E1 are variations of the standard UPC-A code. Each digit is constructed of two bars and two spaces. UPC has very precise standards of code size, structure, and numbers to be used.

EAN is an international superset of UPC. EAN-13 has 13 digits, with the first two digits representing a country code. The final digit is, as with UPC, a check digit. EAN-8 is a shorter version on the EAN-13 code containing seven data digits and ending again with a checksum.

The exact UPC/EAN symbol specifications are available from:

Uniform Code Council, Inc.
7887 Washington Village Drive, Suite 300
Dayton, OH 45459
937-435-3870

Specifications are also available via the Internet at:

http://www.uc-council.org

Keep the following guidelines in mind when printing UPC bar codes:

- If you plan to use a "supermarket-type" in-counter scanner to read the codes, specify a bar code height of at least .9" for an optimal first read rate.
- Make it an early practice to observe the numbering conventions of the UPC Council. Do not label unmarked merchandise with a bar code whose numbers may conflict with those already assigned. If products with these numbers are not in your store now, they are likely to be in the future, causing conflicts in your inventory system.
- The leading **N**umber **S**ystem **C**haracter, (the first number of the 11 digits to be entered) should conform to these UPC assignments:

  0,6,7,8 Regular UPC 12 digit codes with numbers assigned by the UPC Council. (Do not use **0** as the leading number for in-store marking).

  2 Store-marked random weight items of meat and produce.
  3 Reserved for National Drug Code and Health Related Items.
  4 Use this leading digit for in-store marking of non-food items.
  5 Reserved for coupons. Do not use this today, or you will not be able to process coupons through your system tomorrow.

Supplemental codes

The UPC standards include the addition of a 2 or 5-character supplemental code as well as the Extended Coupon Code. To read the supplements, you must first enable them using the RF Terminal Setup Menu.

NOTE: *Enabling the supplements disallows the reading of UPC codes from right to left to assure that the 2 and 5 digit supplements are not get missed. Coupon codes can be read from right to left or left to right.*

ISBN Specifications

ISBN (International Standard Book Numbering) bar codes are essentially EAN-13 with a 5 digit supplement, where the first 3 digits are the Bookland country codes of **978** for books and **977** for periodicals. Although the bar code contains 18 characters, the ISBN format uses only 9 of them, along with a newly calculated Mod-11 check digit. For example, a bar code containing the numbers 978055337062153495 would transmit as 0553370626 in the ISBN format.

The RF Terminal has the option of transmitting in the ISBN format.

ISBN specifications are available from:

American National Standards Institute
Customer Service
11 West 42nd St.
New York, NY 10036
http://web.ansi.org
document ISO 2108:1992

The UPC/EAN checksum character

The last character in a UPC-A, UPC-E, UPC-E1, EAN-13 or EAN-8 bar code is the checksum. For reference, these are the methods of calculation:

Checksum calculation for UPC-A, EAN-13 and EAN-8

- Use Worth Data's phone number (it's not a real UPC-A code) as sample data:

  18314589938

- Assign even and odd positions, starting at the right and moving left:

8	**3**	**9**	**9**	**8**	**5**	**4**	**1**	**3**	**8**	**1**
odd	even	odd	even	odd	even	odd	even	odd	even	odd

- Starting with the leading digit, 8, take the sum of all the characters in the odd positions.

  8 + 9 +8 + 4 + 3 + 1 = 33

- Multiply the result of step 1 by 3.

  33 x 3 = 99

- Now take the sum of all the even-position characters.

  3 + 9 + 5 + 1 + 8 = 26

- Add the result in Step 2 to the result in Step 3.

  99 + 26 = 125

- Subtract the result from the next higher multiple of 10.

  Next higher multiple of 10 over 125 = 130
  130 - 125 = 5

- **5** is the ***Modulo-10*** check character. The data to be printed becomes:

  183145899385.

This same formula is used for EAN-13 (using the 1-12 digits) and EAN-8 (using the 1-7 digits).

UPC-E Checksum Calculation

Use the sample data of 123456 to demonstrate the UPC-E checksum calculation:

The 6 digit UPC-E code is converted to a 10-digit code, using an expansion scheme based on the sixth digit:

If the code ends in:	UPC-E Data	Insertion Digits	Insertion Position	10 digit code
0	abcde**0**	**00000**	3	ab**00000**cde
1	abcde**1**	**10000**	3	ab**10000**cde
2	abcde**2**	**20000**	3	ab**20000**cde
3	abcde**3**	**00000**	4	abc**00000**de
4	abcde**4**	**00000**	5	abcd**00000**e
5	abcde**5**	**0000**	6	abcde**0000**5
6	abcde**6**	**0000**	6	abcde**0000**6
7	abcde**7**	**0000**	6	abcde**0000**7
8	abcde**8**	**0000**	6	abcde**0000**8
9	abcde**9**	**0000**	6	abcde**0000**9

Because the sample UPC-E code ends in a **6**, the insertion digits **0000** are inserted at the **sixth digit** (insertion position 6):

1234500006

Add the **N**umber **S**ystem **C**haracter of 0 to the sample data:

01234500006

Use the UPC-A check digit calculation described in the previous section to produce a check digit as if it were a UPC-A code. The check digit for the sample data is:

5

The complete 8 digit code consists of the *Number System Character*, the *original 6 digit code* and the *check digit*:

01234565

Appendix: MSI/Plessey Specifications

Plessey is a variable length numeric only bar code. **MSI** Bar Code is a variable length, numeric-only code with an automatically appended Modulus 10 check digit. MSI is sometimes called ***Modified Plessey Code***. If the user specifies an additional check digit, the MSI code can be 14 digits long, otherwise it has a maximum length of 13 characters. This is how the MSI check digit(s) are calculated:

The MSI **Mod 10** check digit is calculated as follows:

The example bar code data is:

82345

- Form a number from the odd positions, starting in the units position.

  835

- Multiply the new number by 2

  (835) x 2 = 1670

- Add the digits of product

  1 + 6 + 7 + 0 = 14

- Add the even digits of the original number to the result in 3

  2 + 4 + 14 = 20

- Subtract the result from the next highest multiple of 10

  20 - 20 = 0

- New Check Digit

  0

- Data with check digit is:

  823450

The MSI **Mod 11** check digit is calculated as follows:

The example bar code data is:

943457842

- Assign a checking factor to each number, starting with the units position of the number (in this example, the **2**) up to the highest order position (the **9**). Use checking factors of:

  2,3,4,5,6,7,2,3,4,5,6,7...

- Multiply the checking factor with its assigned number and add the products:

  4 + 12 + 32 + 35 + 30 + 28 + 6 + 12 + 36 = 195

- Divide the sum by 11

  195/11 = 17 remainder 8

- Subtract remainder from 11

  11 - 8 = 3

- New Check Digit

  3 (If the remainder is 10, no check digit is added.)

- Data with check digit is:

  943457823

Appendix: How To Scan a Bar Code

The Wi-Fi RF Terminal is available with an optional internal laser bar code scanner. This section will include information on different scanners as well as how to use each one. You can use this information to compare the built-in scanner with other types of bar code scanners that are also available from Worth Data.

Laser Scanners

If you are using a laser scanner, technique is not critical. The scanners are "point-and-shoot"; you can't miss. Upon triggering the beam, the laser scans the bar code multiple times (100 scans per second) until it has a good read, at which point it automatically shuts off. These scanners are more expensive, but virtually foolproof. They read from a distance, so they are much more convenient for distance shelf scanning or scanning in tight spots. Different laser scanners have different distance capabilities. **Table M-1** shows the comparison of all the laser scanners available from Worth Data.

Table M-1. Scanner Comparison Chart

6 mil = high density 40 mil = low density 100 mil = very low density (with paper and retro-reflective label stock)

Scanner	Hi Density Code 39	UPC 100%	40 mil Code 39	Paper 100 mil Code39	Retro-Reflective 100 mil Code 39
LZ160 Laser	0.5" – 4"	0.5 - 7"	1" – 12"	na	20" – 40"
LZ400 Laser	0.5" – 9"	0 – 17"	3" – 44"	9" – 50"	18" – 9.5 ft.
Integrated Laser in Terminal	1"' – 7"	0 – 10"	4" – 29"	10" – 32"	18" – 6.5 ft.
PSC Long Range	7" – 11"	7" - 31"	11" – 9 ft.	24" – 15 ft.	48" – 17 ft.

To scan a bar code using your laser scanner, (whether it be a handheld or integrated)

- put your RF Terminal in One-Way mode with the host computer program not running; or even unplug the serial cable,
- point the laser scanner at the bar code at about 6" away.
- Pull the trigger (or push the button on an integrated model) and line up the beam on the bar code. If you don't get a read, vary the distance of the scanner from the bar code by pulling up or moving down. The idea is to scan through the center of the bar code.

Laser Options

Several options are applicable to all laser scanners that are used with the RF Terminal. These options are: 1) Longer timeout on the laser reading, and 2) Double decode required.

***Longer Laser Reading**:* A temporary solution to problem bar codes is sometimes to increase the length of the time the scanner attempts to read, from the default 2-second beam to a 4-second beam.

Double Decode: The default setting for the RF Terminal is one successful decode results in a "good read". If you are getting incorrect reads, (due to defective bar codes), a temporary solution is to turn on make the RF Terminal perform two straight identical decodes before beeping, outputting data, and completing a "good read" read.

There are two **Setup Options** that do not apply to the LZ160. The two options are:

- "**Aiming Laser Dot**" for a predetermined time before the laser beam expands into a "line" for reading.

- "**Difficult Code 39 Reading**" for reading Vehicle Identification Numbers (VIN) through the automobile windshield. This applies only to the external tethered LZ400 Laser Scanner.

Aiming the Laser Dot:

Sometimes it is difficult to see the laser beam and know you are on the bar code, especially if you are attempting to read outdoors in direct sunlight. The laser can be outputted as a brighter dot for a few seconds, allowing the user to place the dot in the middle of the bar code; then the laser beam starts sweeping for the read. As shipped, the laser beam never forms an aiming dot, but you can program a number of seconds that you wish the aiming dot to appear before the sweeping beam by scanning the following:

"Difficult Code 39 Reading":

This setting facilitates reading of difficult Code 39 bar codes such as the Vehicle Identification Number (VIN number) on automobiles, especially reading through a windshield. VIN numbers are long, often weathered, often dirty, and challenging to read.

To enable the more aggressive Code 39 algorithms necessary to read windshield VINs change the **Decode Option** to 1 or 2 in the **Code 39 Options** menu.

A clean windshield also makes reading bar codes easier.

Appendix: Cable Pin-outs

Below are the pin-outs for our cables. All cables showing a Worth Data part number (*C*xx) are available for purchase. Unless you have experience making your own cables, we recommend buying your cables from us.

For all of the 7000 RF Terminal cables, number pins based on the number sequence of the connector (marked on the connector). The I/O connector is a JAE # DD1P030MA7 Male Connector (DigiKey Part # 670-1021-ND).

C24 DB9 Serial Cable Pin-outs

Pin-outs for Cable C24, a DB9 Female to Worth Data I/O Male 30pin connector

I/O Connector	Function	DB9 Female
20	Ground	1
19	Transmit Data	3
18	Receive Data	2
SHELL	Chassis Ground	1

C24 Null Modem Cable

C22 USB Cable Pin-outs

Pin-outs for Cable C22, a USB A to Worth Data I/O Male 30pin connector.

I/O Connector	Function	USB-A
8	Vbus (RED)	1
6	DATA- (WHITE)	2
4	DATA+ (GREEN)	3
2	Ground (BLACK)	4

C22 USB Modem Cable

C49 TTL Laser Cable Pin Outs Pin-outs

Pin-outs for Cable C49, a Worth Data RJ-45 to Worth Data I/O Male 30pin connector.

I/O Connector	Function	RJ-45 Male
1	GROUND	8
SHELL	SHIELD	7
5	LON	6
14	Trigger	5
3	DLE	4
9	SOS	3
7	DBP	2
13	5V	1

C49 TTL Laser Cable

C13 Zebra Serial Printer Cable Pin Outs Pin-outs

Pin-outs for C13 Zebra Compatible 8pin Din (QLxxx Series Mobile Printers) to Worth Data I/O Male 30pin connector.

I/O Connector	Function	8pin Din
19	TXD	1
18	RXD	2
-		3
25	CTS	4
20	Ground	5
-		6
26	RTS	7
-		8

C13 Zebra Printer Cable

I/O Connector Pin-outs

I/O Connector pin-outs are:

Pin	Function	Pin	Function
1	Ground	16	Ground
2	Ground	17	Audio Out
3	Laser DLE	18	RS-232 RXD
4	USB D+	19	RS-232 TXD
5	Laser EN	20	Ground
6	USB D-	21	RS-422 T+
7	Laser Data	22	RS-422 T-
8	USB Vbus	23	RS-422 R+
9	Laser SOS	24	RS-422 R-
10	-	25	RS-232 CTS
11	5VDC Input	26	RS-232 RTS
12	5VDC Input	27	5VDC Input
13	5VDC Out	28	5VDC Input
14	Laser Trigger	29	Ground
15	Ground	30	Ground

I/O Connector Pin-outs

Remember:

If you make your own cables, you are on your own. Worth Data accepts **NO RESPONSIBILITY** for damages resulting from incorrect wiring.

Appendix: ASCII Code Equivalent Table

The 128 ASCII codes, their 3-digit decimal equivalents and 2-digit hex equivalents are detailed in the below table.

char	hex	3 digit ASCII	char	hex	3 digit ASCII	char	hex	3 digit ASCII	char	hex	3 digit ASCII
NUL	00	000	SP	20	032	@	40	064	‘	60	096
SOH	01	001	!	21	033	A	41	065	a	61	097
STX	02	002	"	22	034	B	42	066	b	62	098
ETX	03	003	#	23	035	C	43	067	c	63	099
EOT	04	004	$	24	036	D	44	068	d	64	100
ENQ	05	005	%	25	037	E	45	069	e	65	101
ACK	06	006	&	26	038	F	46	070	f	66	102
BEL	07	007	'	27	039	G	47	071	g	67	103
BS	08	008	(	28	040	H	48	072	h	68	104
HT	09	009	)	29	041	I	49	073	i	69	105
LF	0A	010	*	2A	042	J	4A	074	j	6A	106
VT	0B	011	+	2B	043	K	4B	075	k	6B	107
FF	0C	012	,	2C	044	L	4C	076	l	6C	108
CR	0D	013	-	2D	045	M	4D	077	m	6D	109
SO	0E	014	.	2E	046	N	4E	078	n	6E	110
SI	0F	015	/	2F	047	O	4F	079	o	6F	111
DLE	10	016	0	30	048	P	50	080	p	70	112
DC1	11	017	1	31	049	Q	51	081	q	71	113
DC2	12	018	2	32	050	R	52	082	r	72	114
DC3	13	019	3	33	051	S	53	083	s	73	115
DC4	14	020	4	34	052	T	54	084	t	74	116
NAK	15	021	5	35	053	U	55	085	u	75	117
SYN	16	022	6	36	054	V	56	086	v	76	118
ETB	17	023	7	37	055	W	57	087	w	77	119
CAN	18	024	8	38	056	X	58	088	x	78	120
EM	19	025	9	39	057	Y	59	089	y	79	121
SUB	1A	026	:	3A	058	Z	5A	090	z	7A	122
ESC	1B	027	;	3B	059	[	5B	091	{	7B	123
FS	1C	028	<	3C	060	\	5C	092	|	7C	124
GS	1D	029	=	3D	061	]	5D	093	}	7D	125
RS	1E	030	>	3E	062	^	5E	094	~	7E	126
US	1F	031	?	3F	063	_	5F	095	DEL	7F	127

Full ASCII Equivalent Table